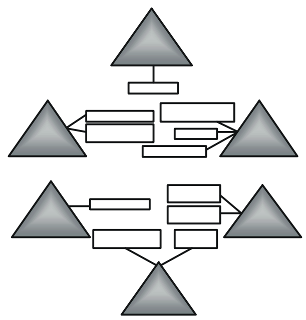
Lieutenant General Hallin Discusses Reengineering Air Force Logistics

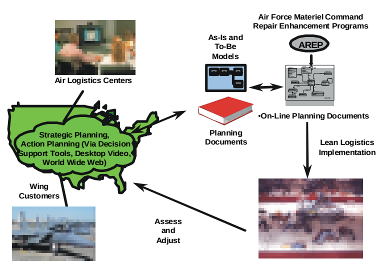
Past Performance: Picking Winners

It makes good business sense to allow past performance evaluation in the selection of contractors. The begging question is then: How should it be implemented?



Depot Operations Modeling Environment

The DOME effort is aimed at addressing some of the most critical problems faced by Air Force logistics-related process redesign efforts.



Royal Flying Corps Logistic Organisation

The logistic organisation developed by the RFC and the support of deployed operations in France between 1914 and 1918.

Also in this issue:

- *Risk Matrix*
- *Operation JUST CAUSE*

Air Force Journal of Logistics

Volume XXII, Number 1

AIR FORCE JOURNAL of LOGISTICS

Volume XXII, Number 1 **AFRP 25-1**

ARTICLES

DEPARTMENTS

Purpose The *Air Force Journal of Logistics* provides an open forum for the presentation of issues, ideas, research, and information of concern to logisticians who plan, acquire, maintain, supply, transport, and provide supporting engineering and services for military aerospace forces. It is a non-directive, quarterly periodical published under AFI 37-160V4. Views expressed in the articles are those of the author and do not necessarily represent the established policy of the Department of Defense, the Department of the Air Force, the Air Force Logistics Management Agency, or the organization where the author works.

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Reengineering Air Force Logistics

Lieutenant General William P. Hallin, USAF

From some of the rhetoric associated with a revolution in business affairs, the National Defense Panel, and the Quadrennial Defense Review, one might get the impression that we "loggies" have been sitting on the sidelines watching our business stagnate. Well, nothing could be further from the truth. In the following paragraphs, I want to set the record straight and highlight many of the innovative logistics reengineering initiatives we have already implemented or are about to implement.

What is reengineering? It refers to taking a process, breaking it down, analyzing the minute details, then refining and rebuilding it into a more efficient operation. We often do reengineering to "cut the fat," and more often than not, we find inefficiencies in our operations and gain savings. Innovative logisticians have been reengineering logistics processes and functions for years. These forward thinking individuals have "broken the glass" of traditionalism and looked at the way we do things with a fresh approach. The result has been new, more efficient and effective operations.

A recent success story has been the evolution of two levels of maintenance to Lean Logistics to Agile Logistics. The Lean Logistics concept came about because of the need to support smaller, faster forces involved in Joint operations with a dwindling resource base and with less forward basing than we have had in over half a century. Agile Logistics is a more positive description of the collection of initiatives providing a worldwide logistics system that allows operational commanders and their combat forces to move faster, farther, and with more flexibility than has ever been possible. Plus, we have seen other benefits such as reduced cost, manpower savings, a smaller mobility footprint, and time savings in virtually every associated process. The bottom line is Agile Logistics is now the Air Force way of doing business.

The strategy of Agile Logistics was developed from the three goals described in the DoD Logistics Strategic Plan: reduce logistics response time, develop seamless logistics systems, and streamline our logistics infrastructure.

The first goal of reducing logistics response time is to evolve from a supply-based system to a transportation-based system by leveraging on the agility and relative low cost of transportation versus the costly investment in large inventories. Current and future technology allows us to order spares virtually "real time," and more efficient commercial and military transportation alternatives make large inventories unnecessary. However, to ensure success, we must reduce the cycle time to get parts repaired and back to the field. The recent reduction in aircraft avionics cycle time from 17 to just 9 days is truly a success we must replicate across each segment of the logistics pipeline.

The second goal involves developing seamless logistics systems that can be applied to both information and materiel. To be successful, we must be able to freely flow information and materiel across logistics functions, between organic and commercial service providers, between combat and support units, and from the shop level up to theater headquarters level. Seamless systems have the potential to give logistics managers and users the visibility to "see" assets in the pipeline, react to logjams quickly, and reduce the "fog of war" for the supplier and especially the customer.

The third goal involves improving our support to the warfighter, by reducing our mobility footprint. We have made tremendous strides in this area through development and implementation of the Two-Level Maintenance (2LM) concept. This concept has already replaced many of the field-level intermediate maintenance capabilities with a centralized, CONUS-based, time-definite, more responsive, repair and distribution system. The net effect allows units to deploy with less equipment and personnel, maximizing critical airlift. It also has the effect of providing a less lucrative target base for adversaries that would attempt to neutralize our maintenance capability. More importantly is the financial success. Two-Level Maintenance has resulted in $259 million in savings and the reduction of 4,430 personnel positions—without reducing our support to the warfighter.

Supply has also seen success in their reengineering efforts. Through regionalizing their back shop functions of stock control, stock fund, equipment maintenance, records maintenance, MICAP, and computer operations into centralized functions at four major commands (Air Combat Command [ACC], Air Mobility Command [AMC], Pacific Air Forces [PACAF], and United States Air Forces in Europe [USAFE]), supply will become more efficient, providing more "bang for the buck" than ever before. The concept of regionalization started with the inception of the Air Force Contingency Supply Squadron (AFCSS) at Langley AFB, Virginia. This organization stood up in response to DESERT SHIELD/STORM to provide more agile supply support to our combat forces deployed to the Area of Responsibility (AOR). From the very beginning, AFCSS proved its worth, reducing the supply mobility footprint by over 450 personnel. Since 1992, AFCSS has continued to provide contingency support to deployed commanders.

ACC was the first major command (MAJCOM) to begin the regionalization effort and, to date, has brought one base on line with two more bases upcoming in the next several months, with plans for complete regionalization by the end of 1999. USAFE and PACAF will start regionalizing their bases in the 1998-2000 time frame with AMC to follow. The regions will not only provide peacetime support, but will be responsible for providing contingency support to forces deployed to their AOR. This important initiative brings the supply community one step closer to a more agile support system while saving an estimated 570 authorizations.

A second supply reengineering effort is being tested at Shaw AFB, South Carolina. This involves significantly reducing peacetime operating stock (POS) and increasing the use of the International Merchants Purchase Authorization Card (IMPAC) to purchase non-weapon-system spares. Under this program, base supply would only stock those assets required to maintain the weapon system. All others would be procured from sources using the IMPAC, blanket purchase agreements, or other non-stock fund options. Initial customer feedback has been very positive.

In fact, the IMPAC program has been a huge success and a very innovative approach to the way we have previously done business. It has given wing commanders the flexibility to close the base service stores, tool issue centers, and individual equipment elements. Cutting-edge technology is allowing this to happen now with the pending rollout of the Electronic Commerce Mall (EMALL), sponsored by the Defense Logistics Agency. EMALL will empower customers to search, locate, compare, and order material using near-real-time visibility of public and private sector inventory levels via the internet. Not only could this one-stop shopping provide access to over 2.6 million items, it could also reduce logistics response times by directing orders to approved vendors with the parts on hand. The General Supply Agency (GSA) has seen the advantage of web-based ordering and offers on-line ordering capability through their web site or by a toll-free number. GSA will deliver the items purchased directly to the customer's desk and accept the IMPAC as method of payment.

Another superb example of reengineering involves two separate and distinct organizations joining forces to provide better customer support. Again at Shaw AFB, the supply and transportation squadrons have reengineered and are testing their movement, receiving, and shipping processes. In this test, each squadron's movement processes were combined and assigned to transportation's vehicle operations branch. In addition, the base was divided into two delivery zones to more efficiently cover the base, cutting down delivery times and distances. Finally, the delivery schedules were changed to ensure better customer service. Bulk deliveries are now made twice daily, bin deliveries four times each day, and priority deliveries are made on an as needed basis.

In the receiving process test, transportation personnel are working in base supply so that property inbound to the base only requires one stop and that is at supply. Here, the transportation and supply specialists check the load manifest, off load property, and either process it into the supply system or it is picked up by vehicle operations for customer delivery.

The final test is being conducted in shipping. Transportation collocated their surface freight personnel with supply so that property destined for shipment off base does not have to transit two buildings before shipment. This has eliminated redundancies in supply and transportation shipment processes, resulting in quicker shipment of critical assets.

Transportation is also involved in cutting edge reengineering processes. Since 1994 we have participated in a DoD directed Joint Service effort to reengineer DoD travel systems. The goal is to develop a seamless, paperless temporary duty travel system that reduces costs and supports mission requirements while providing superior customer service. We have already streamlined entitlement and documentation requirements and have simplified accounting processes from voucher submission to electronic funds transfer payments. Initial data from 27 test sites supporting over 50,000 travelers have shown marked improvements, reducing some process times by 50%. Two other teams have been working Permanent Change of Station (PCS) and Inactive Reserve Travel reengineering and will soon release their results. While these initiatives represent complicated processes that are not necessarily easy to orchestrate, we are aggressively engaging the right level of expertise in the Services and private industry to move forward and impact significant changes.

Additionally, our cargo folks are heavily involved in reengineering the Defense finance process. The objective is to reengineer the shipping and payment process using commercial bills of lading with air express and motor carriers and using IMPAC as a payment tool. Initial results indicate over 50% less time required to prepare bills of lading for express carriers and a 78% saving for motor carriers. The reengineered payment process resulted in a 90% reduction in Defense Finance and Accounting Service processing charges and greater visibility over obligations and expenditures.

Reengineering is an effective tool to capture increased productivity and reduce costs. I encourage each of you to look for ways to reengineer your function. Don't be afraid to "break the glass" and look at your processes with a fresh approach. Everything you do can be done smarter, faster, and probably cheaper. I depend on you to find the inefficiencies in your areas—track them down, and destroy them.

General Hallin is presently the Deputy Chief of Staff, Installations and Logistics, at Headquarters United States Air Force, Washington, DC.

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Best Article Written by a Junior Officer

The Executive Board of the Society of Logistics Engineers (SOLE) Chapter, Montgomery, Alabama, has selected "An Age of Opportunity" (Volume XXI, Number 2), written by Captain Dwight F. Pavek, USAF, and First Lieutenant John P. Schroeder, USAF, in collaboration with Mr. Matthew C. Tracy II, as the best *Air Force Journal of Logistics* article written by a junior officer(s) for Fiscal Year 1997.

Reader Exchange

℞

"No plan survives contact with the enemy" is an old military adage that came to my mind as I read different portions of Vol XXI, Numbers 3 and 4 of the *Air Force Journal of Logistics.*

The introductory article by Lt Gen William Hallin discusses the Air Force core competency of "Agile Combat Support." I noted in particular the discussion of "Responsiveness Versus Massive Inventories." The gist of this section is that we must adopt more business-like practices in managing the issue of resupply. This brought to mind discussions I have heard stating the need for military resupply efforts to operate like a "just-in-time" delivery system used in the civilian world.

A subsequent article in the same issue presents an historical perspective relating to the future of military logistics. It draws the well supported conclusion, that despite advances in technology, the fog and friction of war will always be present.

Clearly, a disconnect exists. While many business-like practices can and should be implemented to increase efficiency, especially during peacetime, we can't overlook the necessity for wartime effectiveness. The concept of "just in time" delivery of key stocks overlooks the fact that there is an enemy out there who is trying to disrupt and destroy our logistics systems, and failure of timely and proper delivery won't just slow or shut down a production line, it will cause failure of the military mission and loss of life.

I hope that in our zeal to institute civilian business practices, we don't forget that military operations have fundamental differences from business. A primary difference is that an enemy is trying to attack cargo aircraft, destroy airfields where they are planned to bed down and be off loaded, blow up supply dumps, interdict road and rail resupply efforts, and, maybe even trying to jam logistics communications or conduct information warfare against our logistics information management systems. Warfare is an extremely extravagant consumer of resources. One reason for this is that we must attempt to plan for potential enemy reactions. But the nature of warfare is that we must plan for effectiveness over efficiency. We must accept that resupply may be disrupted; adequate stocks are needed to continue to bring the war to the enemy. Workarounds may be necessary; less effective munitions may have to be substituted.

Maybe, as a commander in the field, I would feel a little better if I had a bit more ammunition, food, or POL. I can't be very effective if all my "just-in-time" JDAMs have just gone to the bottom with the sinking of a resupply ship. Our optimally designed logistics plan is operating against an enemy who may not react in the manner that we think he should or that we would like him to. Failure to account for this could mean the difference between failure and success in war.

Lt Col Stetson Siler
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Manhattan College
Riverdale, New York

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Logistics Lessons Learned Award

The Air Force Historical Foundation has selected "An Historical Perspective on the Future of Military Logistics" (Volume XXI, Numbers 3 and 4), written by Lieutenant Colonel Karen S. Wilhelm, USAF, as the best *Air Force Journal of Logistics* article that contains logistics lessons learned for Fiscal Year 1997.

Most Significant Article Award

The Editorial Advisory Board selected "Quickness Versus Quantity: Transportation and Inventory Decisions in Military Reparable-Item Inventory Systems" written by Major Christopher J. Burke, USAF, PhD, and Vincent A. Mabert, PhD, as the most significant article in Volume XXI, Numbers 3 and 4, of the *Air Force Journal of Logistics*.

Past Performance: What's Preventing Us Now From Picking Winners?

First Lieutenant Jonathan L. Wright, USAF
Major Cindy L. Fossum, USAF
Richard A. Andrews

Introduction

Choosing government contractors is like deciding what to do on a date. Let's say the basic requirement is to eat out at a restaurant with entertaining atmosphere. While a favorite Italian restaurant will cost a total of $50, the steakhouse will cost $40. One restaurant has strolling violinists while the other allows us to throw peanuts on the floor—both aspects exceed your expectations for ambiance. The quality of food is first-rate. However, from past experience we know that the service at the steakhouse has been lousy. Because of this knowledge, it may be worth the additional $10 to eat cannelloni instead of top sirloin.

Just as the steakhouse's service played an important role in deciding whether or not they can entertain as they advertise, evaluating past performance for government contracts provides a confidence that the offeror (or restaurant) has the capability to accomplish the promises of the proposal. As the choice to have Italian won over the steak, past performance evaluations were introduced into a competitive environment. In this case, as well as in many government cases, past performance has been the final determining factor.

So it makes good business sense to allow past performance evaluation in the selection of contractors. In fact, the federal government's Acquisition Reform made it a mandatory evaluation factor. The begging question is then: How should it be implemented? The steakhouse argues the information pertaining to their lousy service was not wholly their fault. Did we gather their service information from our previous experiences? Or, did we get this information from a friend? If it was our experience, was the poor service due to our continual demands that kept the waitress from doing anything but bending over backwards? And, do we term anything less than five-star world-class service as "lousy?" These questions could delay our date, and worse, they show our decision could be based on inaccurate information. Do standards exist related to implementing past performance in government contracts? Yes and no, it depends on the acquisition range.

Acquisitions between $1 million to $5 million are most commonly performed by our operational contracting squadrons. However, little or no past performance guidance exists for these acquisitions. Plenty of standardization exists for acquisition above $5 million. For contracts below $5 million, organizations are left with the latitude to implement their own methods regarding past performance information collection, storage, and use. We studied the practices related to the implementation of past performance information in order to provide a standard to promote fairness to all offerors.

The research effort answered the following questions:

- How are the contracting officers storing their past performance information?
- What criteria are useful to contracting officers to determine if the information is relevant?
- What are useful sources to collect past performance information?
- What information types are useful?

Recent Emphasis on Past Performance

Initially, the use of past performance information was given a boost in "The Packard Commission." (10) This report calls for more use of commercial-style practices in government acquisitions. Evaluating contractor performance history is one such practice.

In 1993, past performance was established as an official evaluation criteria. Government agencies must "prepare evaluations of contractor performance on all contracts over $100,000 and to specify past performance as an evaluation factor in solicitations for offers for all competitively negotiated contracts expected to exceed $100,000." (9) This mandate was formally signed into law with the passage of the Federal Acquisition Streamlining Act of 1994. (11:4) The Federal Acquisition Regulation (the code of conduct for government contracting) echoes that agencies shall provide inputs into evaluation procedures. (15) Figure 1 reflects the use of past performance information among competitively negotiated contracts. Past performance is used more frequently and with more emphasis among tradeoffs than selections based on the Lowest Priced Technically Acceptable proposals.

The Air Force's past performance guidance is contained in its Lightning Bolt Initiative #6: Enhance the Role of Past Performance in Source Selections. * With this initiative, a team led by Air Force Materiel Command (AFMC) implemented past performance policy revisions, provided standards and methods to assess past performance, and improved the effectiveness of the Contractor Performance Assessment Reporting System (CPARS) by revising the instructions and forms. Only acquisitions greater than $5 million have performance assessments reported in CPARS; those less than $5 million are not reported to a centralized database.

* Mrs. Darleen A. Druyun, Acting Assistant Secretary of the Air Force (Acquisition), released her Lightning Bolt Initiatives on 31 Mar 95 announcing eight major policy areas needing attention. Past performance was encouraged as an equal source selection factor as well as improvements in past performance information systems.

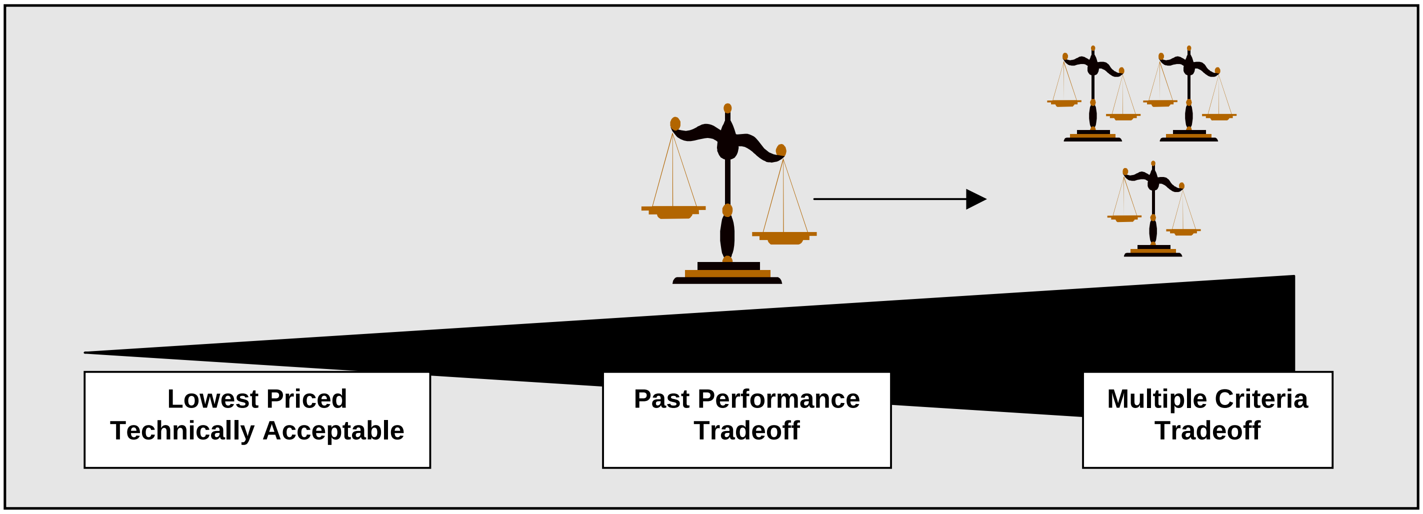

Figure 1. Use of Past Performance Among Competitively Negotiated Contracts

Best Value and Past Performance

Contracting professionals are always compelled to find the most effective and efficient decision criteria for selecting suppliers. For some items, using the lowest priced offer is a sufficient criterion for awarding the contract. Just as deciding between two fast food joints could probably be based on price alone, other situations such as "date night" may call for extra selection factors. For government contracts, these other factors may include the technical proposal, management, and reliability. For any tradeoff, cost and price, quality and technical merits, and past performance are required considerations.

Best value evaluations are used by both the public and private business sectors. (11:3, 12) They both use supplier approval processes, quality system assessments, performance assessments, performance feedback, supplier development/partnering initiatives, and recognition programs. However, the use of past performance information within industry is not comparable to that of the government's size, scope, and complexity. (7) Nevertheless, past performance information has demonstrated its credibility as an evaluation factor in achieving best value. In a study of 300 major Air Force source selections, all but two resulted in actual contract performance being the same as that predicted by previous past performance determinations. (8)

Implementing Past Performance

In a report to the Office of the Secretary of Defense, recommendations were made about the formulation of a past performance policy. The key observation was the value of past performance information decreases as a past performance system is standardized. Thus, focus should be placed on the past performance information that is relevant to each acquisition's business area. Sharing information across similar business areas could be a possibility. (8)

Past performance information is collected for current and future source selections, as shown in Figure 2. The major steps for obtaining past performance information are geared towards collecting information and then validating it. The five most common steps for obtaining past performance information through existing systems are:

1. Evaluating and recording performance.
2. Providing contractors an opportunity for rebuttal.
3. Receiving contractor rebuttals.
4. Reviewing the rebuttal and resolving the evaluation.
5. Filing all information as "Source Selection Information" for use within a three-year period. (9)

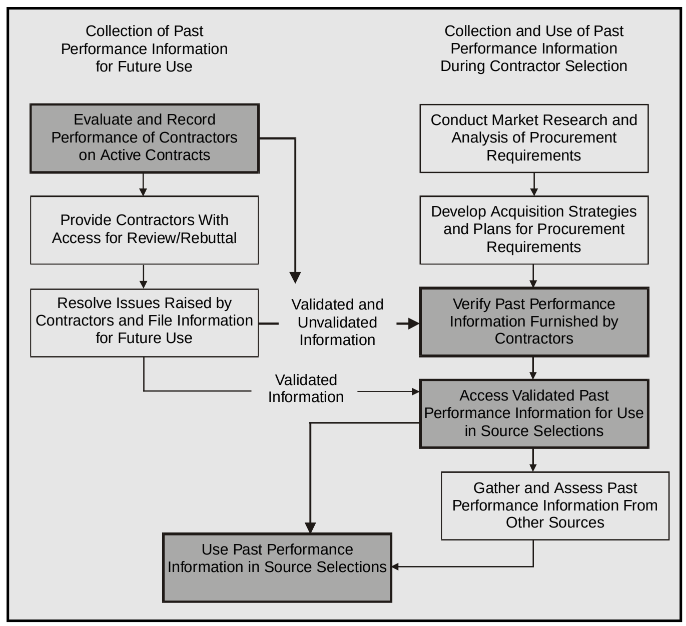

Figure 2. Collection of Past Performance Information

What information should be collected? General categories of demonstrated past performance have been outlined by Dr. Steven J. Kelman, Administrator of the Office of Federal Procurement Policy. This list includes quality, timeliness, cost control, cooperation with the contracting officer, customer satisfaction, and key personnel management of the contract. (1)

The CPARS database contains contractor performance information on acquisitions greater than $5 million. Its categories of past performance information are shown in Figure 3 on the following page. This figure takes Dr. Kelman's six categories and expands them to eleven different past performance information types. (1, 2)

Sources of Past Performance Information

Contracts exceeding $5 million have performance information reported in CPARS. For the contracts below $5 million, organizations themselves must store their own past performance information for future acquisitions.

The primary means of collecting information for the lower dollar acquisitions is through questionnaires and interviews. Questionnaires generate factual information from the offeror related to past contracts (for example, number, dollar amount, and points of contact) and subjective information related to their experience (for example, a unique technical aspect related to the proposal or reasons for a schedule slip). (4)

Significant weaknesses exist with this information collection method. Problems include: the amount of time to locate the right person to survey/interview, respondent reluctance to phone interviews, inability to ascertain respondent objectivity, and ineffectively communicating the questions. (14) The most difficult challenge is finding sufficient reliable information to make an accurate assessment. (6)

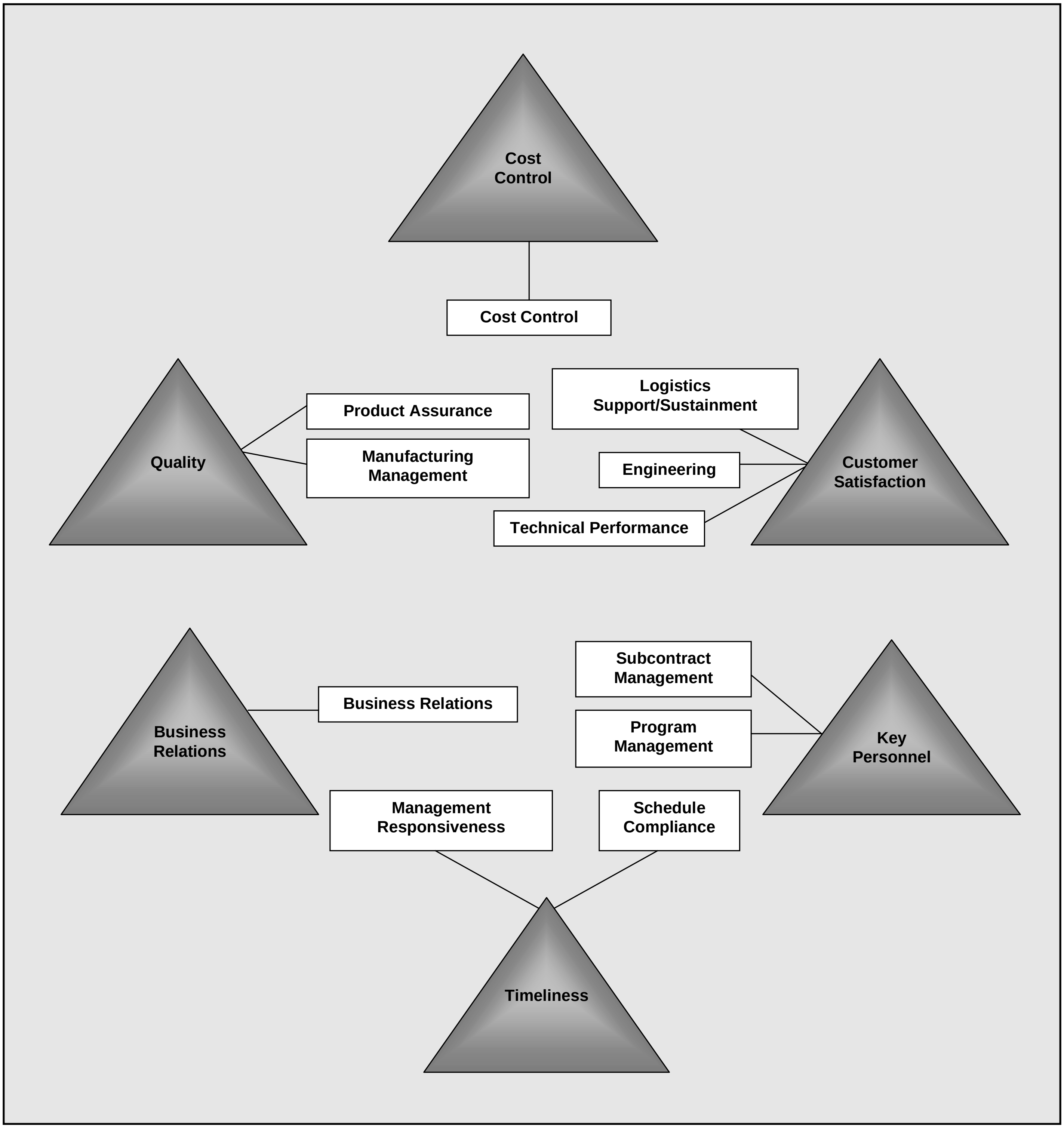

Figure 3. Past Performance Information Types

Other sources may be used in addition to questionnaires and interviews. A multiple source list may include: contract completion evaluations, performance ratings from CPARS, contractor self-assessments, user and buyer evaluations, performance qualifications and/or certifications, offeror's proposals, Contractor Performance Evaluation Program (CPEP) reports, the Acquisition Management Information System (AMIS), and the Defense Logistics Agency's (DLA) Contractor Profile System. (4, 5) Financial reports may also provide information about the offeror's stability/instability. (6)

Efforts must also be made to find contracts not listed in the offeror's proposal as additional sources of performance history. The contract history of each contractor can be found through the Acquisition Management Information System (AMIS), serving information with respect to number, title, and dollar amount for all corporations. (4)

The Contractor Alert List (CAL) also has a system which serves a warning that a condition exists needing consideration prior to award. (4)

Relevancy Determinations

Once the information gathering is complete, it is important to determine if the information is relevant. This is much like deciding if poor waitress service is relevant to our requirement of having entertaining atmosphere. Relevancy is defined as "How closely the skill demonstrated in the prior contract (for example, subcontract management), matches the degree to which that skill will be utilized on the new contract." (3) However, this definition excludes other relevancy criteria such as timeliness of the information or contract dollar amount. Major challenges, such as gathering unbiased, well-documented, objective, and most current information, must be explored to understand the decision to implement a database or to gather past performance information through other means.

The Sample

Eleven contracting personnel from seven organizations within Air Force Materiel Command were interviewed. Policy officials at the command provided points of contact to help identify respondents knowledgeable about past performance and its implementation within their organization. The interviewees were government civilian employees with between 5 to 20 years of contracting experience.

Interviews

The interview technique was the most appropriate and feasible for this particular study. Interviews may obtain data which represent actual policies and the respondents' beliefs and feelings about them. An interview also collects facts about behavior and attitudes by tabulating multiple-choice answers to standardized questions. (13) Additionally, open-ended questions provide unique, in-depth perspectives (for example, "What challenges do you face?"). Each respondent was given the same interview and standardized protocol. The interview questions were designed to satisfy concerns of HQ AFMC, confirm or reject propositions of previous literature, and to learn about the differences in past performance information systems.

Storing the Information

Table 1 displays the various work centers' approaches to a past performance information system.

Organization	Method of Information System	Manual or Electronic
A, B, and C	Use questionnaires predominantly and do not have a database.	Manual
D	Has a repository of quality assurance reports and other records of contractor performance.	Manual
E	Has an unofficial CPARS-formatted database.	Electronic
F	Keeps records of complaints, good comments, and contract history.	Both
G	Maintains a database of contract history (but primarily used for responsibility determinations).	Electronic

Table 1. Past Performance Information Systems

All seven organizations generate new information for every source selection. Three send new questionnaires for each new acquisition as their predominant means of collecting past performance information. The other four gather new information anytime it becomes available, as in the case of quality assurance surveillance reports (for example, deficiency reports or delivery reports).

Several considerations have been weighed in the decision to implement a past performance database. Establishing a database carries a significant investment cost, but after overcoming this hurdle, information is not sufficiently updated due to the time required to record and store information. On the other hand, there must be a standardized information-reporting process in order to promote a fair appraisal system for the contractors. They should not be subjected to various appraisal methods when dealing with multiple bases.

Therefore, if a centralized database was created, significant investment costs and management controls would be required to maintain an effective repository of information for use in past performance evaluations.

Performing Relevancy Determinations

After past performance information is stored, relevancy is the filter that determines if it is useful to a particular acquisition. Figure 4 on the following page displays the number of work centers that found each criteria useful.

All of the organizations agree that Like or Similar Service is a useful relevancy criterion, as relevancy is defined in terms of demonstrated skills on prior contracts. (3) The four major criteria useful in a relevancy determination are: Like or Similar Service, Key Individual, Age of the Information, and User's Input. Each of these criteria narrows performance history down to manageable pieces of information. Other criteria are not as prominent (Contract Dollar Value, Trend of Poor Performance, Length of the Contract, etc.) because they are more subjective.

If one database was to service all work centers for the $1 million to $5 million acquisition range, certain challenges must

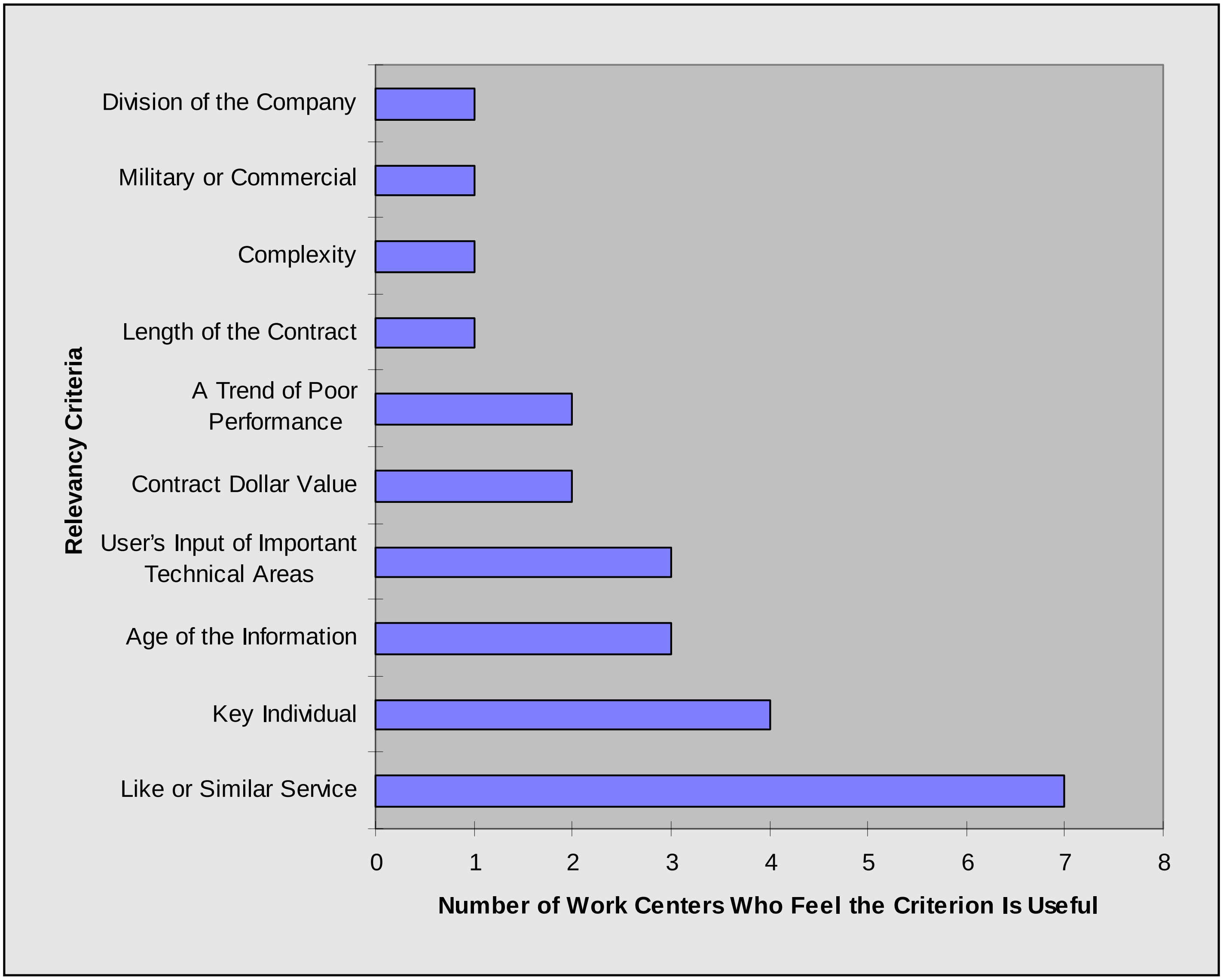

Figure 4. Relevancy Criteria Usefulness

be met. Among these challenges, 71% of the organizations mentioned the lack of good business judgment practiced by the contracting officers and buyers. A negative bias exists because when past performance information is usually gathered it is based on poor performance. Another frustration is with inadequate documentation of the performance and/or lack of definitive comments. It is also difficult to find information less than three years old and to find information on local contractors that may not necessarily have performance history for another organization to use.

Sources of Past Performance Information

All of the organizations use questionnaires and interviews—43% use them as their primary means. They also find CPARS useful in obtaining performance information, but it usually does not store data on local service contractors. "In-house" performance reports are used by 57% when they are aware that the acquisition is similar to an existing record.

Only 43% use AMIS because their computers interface with it. However, AMIS only provides AFMC contract history.

Only 14% use financial reports as a source of cost control history. The others regard this source as more suitable for determining contractor responsibility rather than a part of the competitive evaluations.

No single work center has ever used (or heard of) databases such as the Contractor Performance Evaluation Program, Contractor Profile System, and legal databases. The one who uses the CAL mentioned having a strong relationship with their administrative contracting officers (that is, access to this database).

Past Performance Information Types

Objective information is best suited for the $1 million to $5 million acquisition range. All organizations find Customer Satisfaction useful (that is, technical performance of product) as the end-user's satisfaction is always important. Also, all organizations collect tailored information exclusive to the acquisition at hand (for example, questions regarding performance history only in the particular industry).

Furthermore, 86% find product assurance or having a quality system to be useful. Timeliness (in the form of schedule control) is useful to 86% of the organizations because of the recurring and ongoing nature of supply contracts. However, it is more difficult with service contracts to keep schedule records as delivery information is more appropriate with delivering supplies.

Key Personnel (managing subcontractors) is useful to 86% of the organizations. However, Key Personnel (program management) is useful to just 56% of them. This information type is relevant to those who feel problem solving amidst uncertainty and friction is a key element to achieving contract success of their requirements.

Cost Control is useful to 71% of the organizations, but this information type is appropriate for centers who conduct cost-type contracts.

About 56% find Timeliness useful, as demonstrated in management's responsiveness. This type of information is not as popular because it is rather subjective.

Business Relations is useful to 71%, but this information type should be included merely as a general consideration because of its subjectivity.

On the other hand, only 29% feel that manufacturing management, logistics support/sustainment, and engineering, are useful. These information types are more appropriate for production requirements.

Recommendations and Conclusions

Is it better to build a centralized database for all work centers to use as a primary information source? Or is that like providing a nationwide restaurant guide which takes too many resources to maintain? This issue can be answered with three recommendations:

(1) Search already available databases.
(2) Use objective—not subjective—information.
(3) Allow for differences in relevancy criteria.

First, the decision to establish a database or to obtain past performance information through other means should be derived by considering if the information could first be collected through other effective means. Instead of creating a database to store past performance information, using an already-established database may eliminate redundant work and save significant time and monetary investments. Are there any databases already established? Yes, there are three, but the work centers are unaware of them. Therefore, available databases should be advertised or introduced.

Second, feasibility aspects must first be considered before establishing a database for storing past performance information within the $1 million to $5 million range. Specifically, many service contracts are performed by local contractors, and their information may not be useful to other work centers. Service contracts also pose problems due to their subjective nature. However, a database should not contain subjective information because of the relevancy challenges associated with subjectivity (that is, useful and relevant information for one work center may not be useful for another). These aspects include the potential for communication gaps, negative biases, inflexibility, inaccurate documentation, and outdated information. In fact, 71% of the organizations mentioned the lack of business judgment used in reporting past performance information.

Third, information relevant to one organization may not necessarily be relevant to another organization's requirements. The four criteria, Like or Similar Service, Key Individual, Age of the Information, and User's Input, are most prominent. Although these sound objective, common interview responses reflected the inadequate documentation, inability to find timely information, and negative biases. These forces turn objective information to subjective information. Latitude should be given to each work center as to which past performance information types should be collected. A standardized database would only obfuscate the information as differences regarding relevance exist from one work center to another.

Some organizations have not seen past performance evaluations adequately used because of the wait for the centralized database. Others have found different solutions, and they are working. Because of the differences in relevancy, challenges associated with information collecting, and existence of other databases, standardization of one centralized database is not the answer. The answer is through independent and aggressive collection of accurate unbiased information.

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Deployment Policy

Interim Change 98-01 to Air Force Instruction (AFI) 10-403, *Air Force Deployment Planning*, 1 Dec 97.

Summary of Revisions: Interim change (IC) 98-01 clarifies a perceived contradiction between paragraphs 2.6.3.1. and 2.6.3.1.1. of AFI 10-403. This misconception could lead to a decrease in unit readiness when an operational plan is executed.

The IC replaces paragraph 2.6.3.1.1. with the following: "For units that are not OPlan tasked, the minimum requirement is a single LOGPLAN file containing all UTCs listed as available for tasking by the MAJCOM UTC listing (e.g. ACCMIS, AMC Global Assets Listing, AFRC WMP-3). For units with sourced tasking in OPlans and CONPlans, the minimum requirement is a separate LOGPLAN file for each separate tasking. For all units, the optimum condition for maximum readiness is to build a LOGPLAN to meet the minimum and then add LOGPLAN files for each notional tasking that the unit may be vulnerable to fill. This is particularly important for units with Air Expeditionary Force Tasking. Units tasked under OPlans will build the LOGPLAN using a psuedo-plan identification (Psuedo-PID) IAW AFMAN 10-403. Psuedo-PIDs are available through the MAJCOM Operations Plans Division (e.g. MAJCOM/XP or DOXP) and are maintained by HQ USAF/XOOW."

War Reserve Materiel Policy

As a result of an Air Force Inspection Agency Special Management Review (SMR) of all WRM, we are seeking commonality in medical WRM guidance and procedures in order to create an integrated policy document.

We have enlisted the expertise of the Air Force Logistics Management Agency to study the WRM program. Our expected end-state is a more concrete method for determining WRM requirements, a road map to a global prepositioning strategy that meets the dynamic operational environment, and finally, a single strategy for WRM visibility.

Base Support Planning Policy

AFI 10-404, *Base Support Planning*, has been published and is available on the Internet (http://afpubs.hq.af.mil/). Additionally, we plan to establish a Base Support Planning training working group in the near future.

(Col Carl Cafiero, HQ USAF/ILXX, DSN 227-8860, cafieroc@af.pentagon.mil)

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Lieutenant Wright is presently a project manager in the Contracting Division at the Air Force Logistics Management Agency, Maxwell AFB, Gunter Annex, Alabama. Major Fossum is presently the Director of the Contract Management Program, Graduate School of Logistics and Acquisition Management, Air Force Institute of Technology, Wright-Patterson AFB, Ohio. Mr. Andrews is presently the Department Head of Materiel Management, School of Systems and Logistics, also at the Air Force Institute of Technology.

Behind every great leader there was an even greater logistician.
M. Cox

Logistics must be simple—everyone thinks they're an expert.
Anonymous

My logisticians are a humorless lot . . . they know if my campaign fails, they are the first ones I will slay.
Alexander

CURRENT RESEARCH

Air Force Materiel Command (AFMC) Studies and Analyses Program

The AFMC Studies and Analyses Office (AFMC SAO/XPS), a field operating agency under HQ AFMC/XP, conducts and sponsors studies and research for significant materiel issues. One overriding goal guides SAO's efforts—provide analytic solutions for improved business practices. SAO's efforts focus on the development and enhancement of mathematical models which relate materiel resource decisions to business performance and weapon system availability. This enables the command to prioritize and justify its resource investments. Working closely with the customer, SAO designs and performs studies which ensure a healthy balance between the rigorous application of operations research techniques and practical solutions that can be implemented.

The SAO/XPS senior staff consists of:

Mr. Victor J. Presutti, Jr., Chief, DSN 787-3887
Mr. Curtis E. Neumann, Analytic Applications Function, DSN 787-6920
Mr. Michael R. Niklas, Concept Development Function, DSN 787-7408
(Commercial access for all phones is (937) 257-xxxx)

We invite you to visit our SAO Web Site at: http://www.afmc.wpafb.af.mil/organizations/HQ-AFMC/XP/sao.

Current and Recent Efforts

Retail and Wholesale Stockage Levels for the Air Force

SAO provided technical support during the testing and implementation of Readiness-Based Leveling (RBL). RBL integrates retail (base) and wholesale (depot) environments while determining the best base stockage levels and depot working levels necessary to achieve the lowest expected worldwide base backorders. The RBL model was successfully implemented in May 1997 through D035E, the Readiness-Based Leveling System. Following implementation, SAO made several adjustments to the system based upon feedback from the field. Working closely with the Air Force Logistics Management Agency (AFLMA), improvements included: (1) increasing the speed and accuracy of the model, and (2) updating the model logic to identify potential problem items. SAO also led the design effort for a new forward-looking capability in RBL which will do a better job of setting levels for deploying and deployed units. In a cooperative analysis with the AFLMA, SAO completed the work to determine how best to add logic to RBL to set depot retail levels. This major new capability was implemented in the January 1998 RBL cycle. (Analysts: Bob McCormick, Capt Todd May, DSN 787-3953/4180)

Initial Sparing

The Air Force applies Readiness-Based Sparing (RBS) to calculate recoverable item spares requirements for both peace and war; however, in the past, it was not applied to new systems. In support of several sponsors, SAO developed a spares management system to do this. The system, a FoxPro database linked to the RBS model, is in use today. The F-22 System Program Office uses the system to compute initial peace and war spares and the requirements reengineering team incorporated the system into the revised Air Force provisioning process. Future enhancements to the system include projected buy and repair requirements for flying, non-flying, and consumable (Defense Logistics Agency) items. The revised process improves support, reduces the number of excess spares when transitioning to replenishment, and lowers customer operating costs. (Analysts: Karen Klinger, Michael Niklas, William Morgan, DSN 787-4239/4141/6810)

Reparable Stock Division (RSD) Banding for Effectiveness

AFMC uses banding as a tool to allocate Air Logistics Center (ALC) buy and repair obligation authority for spare parts when available funding won't meet total requirements. It was used in 1997 to allocate, by ALC and weapon system, updated Fiscal Year 1997 (FY97) Obligation Authority (OA) with the issuance of Annual Operating Budget (AOB) Number 3. A major change to the banding methodology, made in 1996, enabled AFMC to consider the non-demand based requirements. These requirements made up the largest portion of total requirements. The change in methodology prompted many questions in 1997. A major issue proved to be that high condemnation items (such as some engine parts) were not treated fairly with this approach. Analysis generally showed items with condemnations did receive slightly lower levels of support. However, the tradeoff was better support for high priority weapon systems like the C-5 and the E-3. This is consistent with the intent of banding—provide better support to higher priority weapon systems. SAO recommended placing the F100 and F110 engines into a higher band. Banding was not used in the allocation of FY98 OA. Instead, Unit Cost Targets (UCTs) were used to establish the Cost Authority for the ALCs. (Analyst: William Morgan, DSN 787-6810)

EXPRESS Implementation Support

SAO actively supported implementation of the Execution and Prioritization of Repair Support System (EXPRESS). Used to manage repair and distribution of recoverable items, EXPRESS closely links recoverable item depot repair and distribution actions to operational customer needs. SAO is the Air Force technical office of primary responsibility (OPR) for the prioritization model embedded in the EXPRESS system. Some of SAO's work involved analysis, development, and model modification to correct existing problems. It also included developing a technique which enables EXPRESS to better focus on weapon system support. The original technique, called the Weapon System Burn Rate, was prototyped by the Warner Robins Air Logistics Center (WR-ALC). SAO enhanced the

Weapon System Burn Rate by developing a further refinement called the Single Prioritization Across Weapon Systems (SPAWS). SPAWS provides the capability to prioritize depot resupply actions across weapon systems in a manner consistent with weapon system priorities. A new model logic was also developed to properly recognize MICAP conditions caused by indentured shop-replaceable units (SRUs). SAO helped WR-ALC identify interim solutions for prioritizing items with long flow/repair times and began work on a permanent solution. The permanent solution involves developing a capability to evaluate the impact of alternative business rules on weapon system availability. Much of SAO's work involved EXPRESS system and policy issues: (1) integrating contractor and organic repair into one process; (2) developing the system changes needed to move EXPRESS distribution functionality to the AFMC distribution system, D035A; (3) developing a repair planning module to assist materiel, maintenance, and financial managers in getting resources in place to execute needed repairs; (4) defining the EXPRESS logic to handle items which have multiple organic and contract sources of repair; and (5) designing an improvement to the original method of spreading repair funding across a year (referred to as the burn-rate) which treats high repair cost items more equitably. An EXPRESS Technical Renovation is underway to meet Year 2000 compliance, improve system performance, reduce operating costs, and achieve technical standardization requirements. SAO is playing a major role in developing the specifications. (Analysts: Bob McCormick, Barb Wieland, Karen Klinger, Rich Moore, Capt Michel Lefebvre, Curt Neumann, Ray Moore, DSN 787-3201)

Market Basket Analysis

The objective of this effort is to establish a "market basket" of reparable items to track costs and monitor prices which AFMC charges customers. SAO identified a group of items, a "market basket," computed their prices from FY93 to FY97, and produced tables which show the trends in these prices. This effort will help develop a methodology for setting future price reductions for AFMC customers. (Analysts: William Morgan, Vic Presutti, DSN 787-6810/3887)

Contract Repair Enhancement Program (CREP) Cost-Benefit Analysis

The objective of CREP is to help AFMC decide whether to pay for improvements in contract repair responsiveness. To make these decisions objective and easier, SAO developed a cost-benefit analysis tool, which compares the cost of shortening contract repair cycle times versus the corresponding reduction in spares requirements. SAO recently improved the tool by integrating component data from the Recoverable Item Requirements System (D041) and helped several depot personnel apply it. (Analysts: Mike Niklas, Bill Morgan, DSN 787-7408/6810)

Demand Forecasting

Traditionally AFMC used an eight-quarter average to predict future demands for recoverable items. SAO was asked to evaluate this baseline against a number of alternative techniques, including exponential smoothing, a four-quarter average, and regression analysis (using both past and future flying program data). The analysis indicates quarterly averages and exponential smoothing (alpha = .3 to .4) along with future program data provide the best forecasts. Regression analysis performed the worst because it falsely interpreted random changes. (Analysts: Tom Stafford, Steve Bankey, Mike Niklas, DSN 787-4141/4342/7408)

Funding/Availability Multi-Method Allocator for Spares (FAMMAS)

SAO developed a research version of the FAMMAS model which runs in Windows 95 and exercised it to determine if it can help allocate "buy" and "repair" funds which are less than the requirement. Several excursions of the model indicated that FAMMAS is too insensitive to large funding changes to be useful. (Analyst: Tom Stafford, DSN 787-4141)

Workload Requirements for the Depot Maintenance Activity Group (DMAG)

SAO continued to develop estimates of DMAG workload requirements. Additionally, SAO modernized and re-hosted the software which computes the wartime surge repair requirement for the Air Logistics Centers. (Analyst: Freddie Riggins, Jr., DSN 787-4535)

AFMC Logistics Response Time - Air Force (LRT-AF)

In a joint effort with the AFMC Logistics Support Office, SAO provided a tool for AFMC and major commands to monitor customer wait times associated with ordering aircraft components from depots. The LRT-AF system also shows the delay time associated with backorders. These backorder delays can be significant. A drill-down capability enables the identification of supply bottlenecks associated with various pipeline segments and specific items. LRT summary charts, data, and software, with monthly updates, will soon be available through a web site. (Analysts: Mike Niklas, Vic Presutti, Curt Neumann, DSN 787-7408/3887/6920)

Computing D035K Order and Ship Time Edits and Default Values

SAO was asked to help compute D035K order and ship time (O&ST) edits and default values using a method proposed by HQ AFMC/LGS, and to offer constructive feedback about the method. We performed the requested computations and offered suggestions we believed could improve the process. SAO suggested they use a weighted average (instead of a straight average) in order to account for an item's activity and keep O&ST values under some maximum value (instead of discarding values). These changes will improve the edits and computed default values. (Analyst: Capt Todd May, DSN 787-4180)

Bow Wave

Readiness problems related to spare parts shortages were major issues at CORONA FALL in November 1997. They were believed to be due in part to funding shortfalls. In preparation for CORONA SOUTH in February 1998, the AFMC Commander directed the funding requirement for buy and repair backlogs (referred to as the bow wave) be quantified and actions identified which could be taken immediately if additional funding became available. He also directed creation of a review board to recommend actions that can be taken in 12 to 24 months to improve Air Force supply chain management. SAO organized the Reparable Spares Management (RSM) Board and acted as the

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Air Force Logistics Management Agency (AFLMA) Fiscal Year 1998 (FY98) Program

Below are AFLMA in-work projects for FY98. If you are interested in any of these projects, please contact the project officer. Commercial access for all phones is (334) 416-xxxx.

Contracting

***Acquisition Streamlining/Reform in Operational Contracting*, LC9622201**

Objective: Develop a roadshow training approach (content and delivery method), which links acquisition streamlining and reform initiatives to the Deputy Secretary for Contracting's (SAF/AQC's) main goals and objectives.

1st Lt Jonathan L. Wright, AFLMA/LGC, DSN 596-4085

***Contractor Operated Parts Store (COPARS) Tools and Guide*, LC9719000**

Objective: Publish a COPARS Guide addressing: background of the program, contracting and transportation processes, roles and responsibilities, pricing/ordering/contract changes, policy, acquisition planning, management and administration of the program, best practices, and keys to success.

SMSgt Jose R. Medina, AFLMA/LGC, DSN 596-4085

Maintenance and Munitions

***Consolidation of Egress Time Change Item (TCI) Inspections*, LM 9827900**

Objective: Determine the actual cost per F-15E aircraft to convert the Egress TCI Inspections to a fixed 42-month inspection cycle.

MSgt Maura A. Barton, AFLMA/LGM, DSN 596-5671

***Flight Safety Critical Aircraft Parts (FSCAP)*, LM9731300**

Objective: Determine the best method for expanding the Air Force FSCAP program in Phase II.

Maj Dorothy J. Tribble, AFLMA/LGM, DSN 596-4464

***Improving Implementation of Reliability-Centered Maintenance (RCM) for Engines*, LM9721700**

Objectives: (1) Define RCM. (2) Summarize development of RCM. (3) Outline requirements of a RCM program. (4) Define impediments to effective implementation of RCM. (5) Provide recommendations for improving management of RCM.

Capt Donald S. Massey, AFLMA/LGM, DSN 596-3778

***Logistics Process Optimization*, LM9731101**

Objectives: (1) Develop a "road map" which identifies near-term, mid-term, and long-term opportunities and requirements for logistics process reengineering. (2) Prioritize reengineering opportunities and requirements. (3) Provide recommendations to the Deputy Chief of Staff, Installations and Logistics (HQ USAF/IL).

Maj Glenn R. Barney, AFLMA/LGM, DSN 596-3885

***Air Expeditionary Force (AEF) Logistics Concept of Operation*, LM9733000**

Objective: Support the development of innovative concepts and investigate alternative ways of supporting AEF operational objectives (for example, develop austere leading edge Unit Type Codes [UTCs] to arrive "just-in-time" to support AEF sortie production objectives).

SMSgt John G. Drew, AFLMA/LGM, DSN 596-4581

***Integrated Maintenance Data Systems (IMDS) Support*, LM9530800**

Objectives: (1) Provide functional logistics expertise to the IMDS program office. (2) Monitor and participate in the planning and design of future maintenance information systems such as IMIS (Integrated Maintenance Information System).

Capt Bradley D. Allen, AFLMA/LGM, DSN 596-4581

Supply

***Analysis of Mission Capable/Awaiting Parts Reporting, Collection, and Information Systems*, LS9400170**

Objectives: (1) Determine Weapon System Management Information System (WSMIS)/Readiness Assessment Module (RAM) end-user information requirements. (2) Identify data required to provide information needed by WSMIS/RAM end users and the most effective and accurate method of retrieving required data. (3) Analyze, document, and recommend improvements to current WSMIS/RAM data transmission processes or, if necessary, outline a redesigned methodology for collecting and reporting required information.

Capt Edward E. Tatge, AFLMA/LGS, DSN 596-4165

***Secondary Inventory Control Activity Nonconsumable Item Material Support Code 5 (NIMSC 5) Process Analysis*, LS9531800**

Objectives: (1) Describe the Primary Inventory Control Activity/Secondary Inventory Control Activity (PICA/SICA) process. (2) Analyze the effectiveness of the process. (3) Develop process improvements for any identified deficiencies.

Maj Bradley D. Silver, AFLMA/LGS, DSN 596-4165

***Readiness Spares Package (RSP) Non-Optimized (NOP) Item Computation Analysis*, LS9601000**

Objectives: (1) Provide Air Force standard NOP equations to compute RSP NOP requirements. (2) Evaluate current equations used to compute RSP authorizations for NOP assets (if any). (3) Develop (if necessary) more accurate equations. (4) Recommend whether tire kits should be based on 30 or 60 days use.

Capt Bradley E. Anderson, AFLMA/LGS, DSN 596-4165

***Individual Equipment Element Cost Benefit Study*, LS9701000**

Objective: Determine a method of operating the Individual Equipment Element that will provide the best value to the Air Force.

Capt Harry A. Berry, AFLMA/LGS, DSN 596-4165

***Execution and Prioritization of Repair Support System (EXPRESS) and Adjusted Stock Levels (ASLs)*, LS9709402**

Objective: Determine how EXPRESS prioritizes ASL items and whether the prioritization technique is fair compared to demand-based needs.

Maj Arthur B. Trigg, AFLMA/LGS, DSN 596-4165

***Cryogenics Functional Process Improvement Study*, LS9708400**

Objectives: (1) Improve the Air Force cryogenics business area. (2) Identify critical processes, customers, and potential process improvements. (3) Establish current resource baseline and projected resource requirements. (4) Determine necessity for in-house liquid oxygen/liquid nitrogen (LOX/LIN) production, determine appropriate depot-level support for cryotainers, and determine roles and responsibilities for base-level cryogenics support. (5) Provide recommended process improvements and estimated cost savings.

SMSgt (Select) Larry C. Ransburgh, AFLMA/LGS, DSN 596-4165

***Adjusted Stock Level Approval Process*, LS9709401**

Objectives: (1) Identify a core set of business rules to provide standardized guidance for evaluating proposed levels. (2) Develop the tools necessary for implementation.

Maj Bradley D. Silver, AFLMA/LGS, DSN 596-4165

***Execution and Prioritization of Repair Support System (EXPRESS) and Communications/Low Density Items*, LS9709403**

Objective: Determine if EXPRESS, in its current form, works for communications and low density items and if these items receive sort values that allow them to compete with demand driven sort values.

Major Arthur B. Trigg, AFLMA/LGS, DSN 596-4165

***Reengineering the Recoverable Assembly Management Processing System (RAMPS)*, LS9712000**

Objectives: (1) Document lessons learned from earlier AFLMA retail-wholesale transmission studies and Air Force dirty data studies. (2) Apply these lessons to recommend changes to the entire RAMPS reporting system. (3) Outline how the reengineered RAMPS reporting process should be implemented within the Integrated Logistics System-Supply (ILS-S)/ Government Online Data (GOLD) system environment of the future.

Capt Edward E. Tatge, AFLMA/LGS, DSN 596-4165

***Forward Supply Locations (FSLs) - FSL Inventory Policy*, LS9713500**

Objectives: (1) Document Air Mobility Command's (AMC's) business rules for stockage policy (XB/XF). (2) Identify and test alternative range and depth rules for both consumables and recoverable (XD) items, supply and operational availability, and cost effectiveness (stockage and lost revenue).

Capt James A. Neice, Jr., AFLMA/LGS, DSN 596-4165

***Fuels Additive Injection Study*, LS9715401**

Objectives: (1) Identify current and alternative procedures for jet fuel additive injection, with emphasis on determining the best location to inject each required additive in the wholesale (Defense Logistics Agency) and/or retail (base level) distribution system. Include the following additives: Fuels System Icing Inhibitor (FSII), Static Dissipative Additive (SDA), Corrosion Inhibitor (CI) and +100. (2) Identify resource requirements and cost impacts of implementing, maintaining, and operating current and alternative jet fuel injection procedures. (3) Determine impact of current and alternative procedures for jet fuel additive injection on base level fuel quality control. (4) Provide supporting details and recommendations to Headquarters USAF/ ILSP and Major Command/LGSF to support decision process.

SMSgt (Select) Stanley G. Mynczywor, AFLMA/LGM, DSN 596-4581

***Harmonization of Air Force and Defense Logistics Agency (DLA) Economic Order Quantity (EOQ) Policies*, LS9718904**

Objectives: (1) Perform an analysis of Air Force ordering policies (lot size and ordering frequency) for DLA managed items (XB3) in D035K accounts in order to understand the potential improvement in DLA support to the Air Force and associated costs of policy alternatives (ordering more frequently in small quantities). (2) Determine if the Air Force's ordering system results in lower support to the Air Force (based on Air Force stockage effectiveness and DLA stockage policies. (3) Determine the cost and supply effectiveness of ordering smaller quantities more often. (4) Recommend Air Force ordering policy changes for D035K accounts if needed.

Capt Harry A. Berry, AFLMA/LGS, DSN 596-4165

***Analysis of Order and Ship Time (O&ST) Values in D041*, LS9722500**

Objectives: (1) Determine the most appropriate method to compute accurate actual O&ST data for the D041 requirements computation process. (2) Determine when D041 should use actual O&ST values. (3) Determine other uses for actual O&ST data (for example, performance measures).

MSgt Robert A. Nicholson, AFLMA/LGS, DSN 596-4464

***Reducing O&ST Pipeline for Field Reparable (XF) Items*, LS9724100**

Objective: Develop a method for the Standard Base Supply System (SBSS) to perform an economic trade-off to determine which, if any, XF items should use premium transportation.

MSgt Robert A. Nicholson, AFLMA/LGS, DSN 596-4165

***Air Force General Support Division (GSD) Excess Inventory Analysis*, LS9724101**

Objectives: (1) Determine why excess items are being retained. (2) Recommend ways to expedite the reporting, shipping, and/or disposing process.

Capt James A. Neice, Jr., AFLMA/LGS, DSN 596-4165

***Aerospace Maintenance and Regeneration Center (AMARC) Supply Study*, LS9726900**

Objectives: (1) Determine the most appropriate supply support structure for AMARC/LGS (host account, satellite account, or standard organizational account). (2) If possible, quantify increased sales of AMARC "hidden inventory" parts with improved asset visibility to meet the Air Force MICAP requirements. (3) Determine the most appropriate way to improve visibility of D003 data. (4) Examine the current D003 hardware. (5) Examine current software/reporting procedures. (6) Examine re-hosting D003 data at a Defense Megacenter.

Mr. William R. Burrell, AFLMA/LGS, DSN 596-4165

***Execution and Prioritization of Repair Support System (EXPRESS) Analysis,* LS9729000**

Objectives: (1) Ensure EXPRESS has consistent data and business rules between retail and wholesale levels for: repair, distribution and redistribution, and requisitioning. (2) Review existing performance measures, and if required, develop new performance measures. (3) Recommend policies and procedures to ensure an accurate database.

Capt Harry A. Berry, AFLMA/LGS, DSN 596-4165

***Execution and Prioritization of Repair Support System (EXPRESS) and Primary Aircraft Authorization (PAA) Study,* LS9801500**

Objectives: (1) Evaluate how the program logic in EXPRESS treats bases with dissimilar PAA. (2) Analyze impact of weapon system management roll up to common mission designator series versus unique configuration shread-outs as required by nature of Special Operations Forces (SOF) mission. (3) Identify depot repair policies or repair execution procedures including funding aspects which may negatively impact SOF repair prioritization/distribution decisions.

Major Arthur B. Trigg, AFLMA/LGS, DSN 596-4165

***Luke F-16 Training Wing Revisited,* LS9802700**

Objectives: (1) Reinvestigate Luke AFB supply effectiveness indicators to identify their overall supply support position relative to other F-16 units. (2) Analyze how Depot Repair in Variable Environments (DRIVE), Execution and Prioritization of Repair Support System (EXPRESS), and Readiness Based Levels (RBLs) system interactions impact units without Readiness Spares Package (RSP) authorizations.

Major Arthur B. Trigg, AFLMA/LGS, DSN 596-4165

Transportation

***Outsourcing of Transportation Functions,* LT9702203**

Objectives: (1) Gather processes and lessons learned from transportation units that have completed or are in the process of outsourcing. (2) Compile data in order to assist other units in their pursuit of meeting Air Force objectives by highlighting potential pitfalls and offering solutions in advance. (3) Answer the following question with compiled data, "What information would benefit you the most concerning outsourcing?" This question should be answered by those transportation units that have already outsourced and will be useful to those units in the process of outsourcing.

Capt Michael T. Conley, AFLMA/LGT, DSN 596-1699

***Benchmarking Vehicle Maintenance Practices,* LT9705600**

Objective: Benchmark world-class commercial and Department of Defense organizations, and find and implement their best business practices as standard Air Force vehicle maintenance business practices.

Capt Patrick K. Pezoulas, AFLMA/LGT, DSN 596-6436

***Upgrade Vehicle Replacement Model,* LT9827600**

Objectives: (1) Make the vehicle replacement model more user friendly to operate, add additional utilization factors (miles/hours) to the economic life expectancies determination, and reflect "wasted dollar values" for retaining vehicles beyond economic life. The model should identify wasted dollars if the vehicle is disposed of before the suggested replacement life. (2) Make an impact assessment to ensure the upgraded model is Year 2000 compliant.

Capt Michael T. Conley, AFLMA/LGT, DSN 596-1699

***Depot Overhaul Reliability Study,* LT9834600**

Objective: Determine the reliability of special purpose vehicles returned to the active Air Force vehicle fleet after release by depot overhaul contractor.

Capt Michael T. Conley, AFLMA/LGT, DSN 596-1699

Logistics Plans

***National Air & Space (Warfare) Module (NASM),* LX9827502**

Objective: Provide technical expertise from all logistics disciplines to ensure realistic logistics objectives and scenarios are incorporated into current and future warfare simulation modules.

Capt Donald E. Cohen, AFLMA/LGX, DSN 596-3535

***War Reserve Materiel (WRM) Analysis,* LX9722700**

Objectives: (1) Provide inputs to the Worldwide WRM Working Group and Air Force WRM Executive Review Board. (2) Develop an approach to provide a repeatable method for WRM requirement determination. (3) Establish a strategy to ensure WRM asset visibility. (4) Recommend a WRM pre-positioning strategy that ensures efficient utilization of limited resources to support commanders in charge (CINCS).

Capt Paul E. Boley, II, AFLMA/LGX, DSN 596-3535

***Logistics Officer Career Handbook,* LX9833501**

Objective: Develop a logistics officer handbook that includes career opportunities, education and training, and potential career paths open to logistics officers across all 21XX Air Force Specialty Codes (AFSCs).

Capt Maria L. Garcia, AFLMA/LGX, DSN 596-3535

***Global Engagement 98,* LX9808200**

Objectives: (1) Demonstrate responsiveness through facilitating real time decision support for force allocation and basing plus reception/beddown capabilities. (2) Demonstrate sustainment capabilities by providing feedback on sustainment of operations: retrograde, reach back, and time-definite delivery. (3) Illustrate the effects of weapons of mass destruction (WMD) on support capability at beddown locations and the sustainment pipeline. (4) Provide feedback that will specifically address mobility, Air Force Materiel Command (AFMC) capabilities, and pipeline choke points.

Capt Maria L. Garcia, AFLMA/LGX, DSN 596-3535

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Risk Matrix: An Approach for Identifying, Assessing, and Ranking Program Risks

Paul R. Garvey
Zachary F. Lansdowne

Introduction

Risk Matrix is a structured approach that identifies which risks are most critical to a program and provides a methodology to assess the potential impacts of a risk, or set of risks, across the life of a program. The approach was devised by the acquisition reengineering team at the Air Force Electronic Systems Center (ESC) in 1995. (4) Since January 1996, a number of ESC programs have implemented Risk Matrix.

To facilitate its use, The MITRE Corporation developed a Risk Matrix software application. New analytical features were also added as part of the software development. These include an automated way to cross-check the risk ratings produced by Risk Matrix, as well as an approach for measuring risk mitigation progress. Built in Excel 5.0, the application is cross-platform compatible and can be used on either the Macintosh or PC platforms. This article describes the original Risk Matrix, recently added analytical features, and the software application.

Original Risk Matrix

In Risk Matrix, a risk refers to the possibility that a program's requirement cannot be met by available technology or by suitable engineering procedures or processes. The approach focuses on the requirements-technology pair as the basis for identifying whether a risk exists to the program. A sample Risk Matrix is shown in Table 1. Once a risk (or set of risks) is identified, the subsequent steps in a Risk Matrix are: assess its potential program impacts, hypothesize the probability the risk will occur, rate the risk according to a predetermined scale, and document an action plan to manage/mitigate the risk.

A Risk Matrix is typically completed by a risk management Integrated Product Team (IPT) in a workshop environment. The participants are usually members of the program office and are familiar with the program's technical and programmatic issues, as well as with relevant technologies. They need to work together to identity the program risks and to make the impact and probability assessments. The results are then entered into the Risk Matrix software application, or simply recorded on paper in the appropriate columns. Table 1 illustrates the original Risk Matrix developed in 1995. (4) Each column is defined as follows:

- **Requirements**. List the program's requirements. Typically, these come from two main sources: high-level operational requirements, such as the Operational Requirements Document (ORD), and programmatic requirements, such as those listed in the Program Management Directive (PMD).
- **Technology**. List available technologies that would help meet each requirement. If the technology does not exist or is not mature enough to support the requirement, the probability of a risk occurring becomes higher.

Requirement (Threshold)	Technology	Risk	*I*	P_o %	*R*	Manage/Mitigate
1. VHF Single Channel Communications	ARC-186	• Poor Design	C	0-10	M	• Demonstration as Part of Source Selection
2. Talk SINCGARS	ARC-210 ARC-201 GRC-114	• Algorithm Misunderstood • ICD Problems	C	41-60	H	• Demonstration as Part of Source Selection
3. Talk 100 Miles	ARC-210	• Antenna Performance	S	61-90	M	• Key Parameter of Test Program
4. Go On A-10, F-16, JSTARS and ABCCC	Technology Currently Not Available	• Wrong Power Supply Ratings • Wrong Connectors • Cosite Problems	Mi	0-10	L	• Aircraft Surveys During Ground Team Meeting
5. Control Radio With Control Head	N/A	• Hard to Get Pilot Consensus	Mi	91-100	H	• Control Head Demonstrations Early in Program
6. Joint Program Office	N/A	• Different Users	S	41-60	M	• Information and Decision-Making System
7. Schedule: 24 Months Delivery	N/A	• Integrated Circuit Lead Time	S	11-40	M	• Incentivize On-Time Delivery

Table 1. Sample Risk Matrix Chart

- **Risks**. Identify and describe the risks that might prevent available technology from meeting each requirement.
- **Impact (*I*)**. Assess the impact the risk could have on the program. A default scale is defined in Table 2.
- **Probability of Occurrence (P_o)**. Assess the probability the risk will occur. A default scale is defined in Table 3.
- **Risk Rating (*R*)**. Determine the risk rating (either Low, Medium, or High) by mapping each (I, P_o) pair into the default matrix shown in Table 4.
- **Manage/Mitigate**. The final step is to document the team's strategy to manage/mitigate the risk.

Borda Voting Method

Once a Risk Matrix is populated with a complete set of inputs, questions arise such as: Which risk is most critical? Where should resources be allocated to eliminate the most troublesome areas of the program? Because Table 4 supports only three distinct ratings (High, Medium, or Low), Risk Matrix's original rating method necessarily yields an ordering with many ties. In the case of the sample Risk Matrix chart in Table 1, two risks tie for first place (the High designations), four risks tie for the second place (the Medium designations), and one risk is in third place (the Low designation). In an actual application of Risk Matrix, seven risks tied for first place, thirty-two for second place, and nineteen for third place. With so many ties, it is difficult to isolate the most critical areas of risk from those that are less threatening to the program.

To deal with ties, we incorporated a simple technique from voting theory into the Risk Matrix software application. The technique is known as the Borda method. (2,5,6) When applied to Risk Matrix, the Borda method ranks risks from most to least critical on the basis of multiple evaluation criteria, as described next.

Let *N* be the total number of risks, which is the same as the number of rows in Risk Matrix. Let the index *i* denote a particular risk and the index *k* denote a criterion. The original Risk Matrix

Impact Category	Definition
Critical (C)	An event that, if it occurred, would cause program failure (inability to achieve minimum acceptable requirements).
Serious (S)	An event that, if it occurred, would cause major cost/schedule increases. Secondary requirements may not be achieved.
Moderate (Mo)	An event that, if it occurred, would cause moderate cost/schedule increases, but important requirements would still be met.
Minor (Mi)	An event that, if it occurred, would cause only a small cost/schedule increase. Requirements would still be achieved.
Negligible (N)	An event that, if it occurred, would have no effect on the program.

Table 2. Risk Matrix Impact Assessments (Illustrative Definitions)

Probability Range	Interpretation
0-10%	Very Unlikely to Occur
11-40%	Unlikely to Occur
41-60%	May Occur About Half of the Time
61-90%	Likely to Occur
91-100%	Very Likely to Occur

Table 3. Probability of Occurrence (P_o): Illustrative Interpretations

	Negligible	Minor	Moderate	Serious	Critical
0-10%	Low	Low	Low	Medium	Medium
11-40%	Low	Low	Medium	Medium	High
41-60%	Low	Medium	Medium	Medium	High
61-90%	Medium	Medium	Medium	Medium	High
91-100%	Medium	High	High	High	High

Table 4. Possible Risk Rating Scale (*R*)

has only two criteria: the impact I is denoted by k = 1 and the probability assessment P_o is denoted by k = 2. If r_{ik} is the rank of risk i under criterion k, the Borda count for risk i is given by

$$b_i = \sum_k (N - r_{ik})$$

Equation 1

The risks are then ordered (ranked) according to these counts. If ties are present in the criteria rankings, the r_{ik} are adjusted by evaluating the rank for a tied alternative as the arithmetic average of the associated rankings. (5,6)

Table 5 is a screen capture that shows how the data in Table 1 appear in the application program. Although Table 5 is very similar to Table 1, a major difference is the new column labeled "Borda Rank." The Borda method is used to aggregate the rankings for I and P_o to obtain an overall ranking for the risks. These results are displayed in the new column. The Borda Rank for a given risk is the number of other risks that are more critical. For example, risk number 2 has a Borda Rank of 0, identifying it as the most critical area of the program. Risk number 7 has a Borda Rank of 5, indicating that there are 5 other risks that are more critical.

The Borda method provides several advantages in this application. First, it generally yields a risk ranking with fewer ties than the risk ratings yielded by Table 4. A tie occurs when two risks have the same rating R (High, Medium, or Low) or the same Borda Rank. For example, Table 1 has two risks with the High rating and four risks with the Medium rating, whereas Table 5 has only two risks with the same Borda Rank. This example shows that the Borda method does not necessarily eliminate all ties.

Second, the Borda method does not require additional subjective assessments beyond the original I and P_o inputs. In contrast, the ratings in Table 4 are based entirely on subjective assessments.

Third, the Borda rank can be used as a cross-check on the Risk Matrix ratings. They are jointly displayed in Table 5 and require the same inputs. The rank orders may differ between the two methods, beyond simply reducing ties. For example, the Borda method gives risk number 3 a higher priority than risk number 5, even though Table 1 suggests that risk number 5 has a higher priority than risk number 3.

Fourth, a sensitivity analysis can be performed on the I and P_o assessments for a given risk. Such an analysis would show what changes are needed to yield a noncritical rank position for a particular risk.

Risk Mitigation Tracking

We also incorporated into the software application an optional method for tracking the progress of risk mitigation actions. The first step is to develop an action plan, composed of a varying number of tasks, to mitigate a given risk. At any point in time, each task in an action plan has a particular status, such as completed or on-track. The second step is to assign one of four colors to represent the status of each task: Blue, Green, Yellow, and Red. The interpretations for these colors are given in Table 6. The third step is to translate each color into the probability that the implementation of the associated task will fail. The default translations are given in Table 6, but they can be changed within the program.

Based upon the color assessment made for each task in an action plan, the fourth step is to evaluate the probability of action plan failure (P_{apf}):

$$P_{apf} = 1 - \prod_j \; [1 - \mathrm{v}(y_j)]$$

Equation 2

where y_j is the status color assessed for jth task within the action plan, and $v(y_j)$ is the probability that the implementation of this

Risk No.	Requirement (Threshold)	Technology Available	Risk (to meeting the requirement)	I	Po (%)	Borda Rank	R	Manage/Mitigate
1	VHF Single Channel Comm	ARC-186	Poor design	C	10%	4	M	Demonstration as part of Source Selection
2	Talk SINCGARS	ARC-210, ARC-201, GRC-114	Algorithm misunderstood, ICD problems	C	60%	0	H	Demonstration as part of Source Selection
3	Talk 100 Miles	ARC-210	Antenna performance	S	90%	1	M	Make a key parameter of Test Program
4	Go on A-10, F-16, JSTARS and ABCCC	Technology currently not available	Wrong power supply ratings, wrong connectors, cosite problems	Mi	10%	6	L	Aircraft Surveys during Ground Team Meeting
5	Control Radio with Control Head	N/A	Hard to get pilot consensus	Mi	100%	2	H	Control Head Demonstrations early in
6	Joint Program Office	N/A	Different Users	S	60%	2	M	Information and Decision Making system
7	Schedule: 24 mos. Delivery	N/A	Integrated circuit lead time	S	40%	5	M	Incentivize on-time delivery

Table 5. Risk Matrix Spreadsheet

Color	Interpretation	Default Failure Probability
Blue	The Task Has Been Completed	0.0
Green	The Task Is on Schedule	0.1
Yellow	The Task May Not Be Completed on Schedule	0.5
Red	The Task Is Considered Nonexecutable	1.0

Table 6. Assessment Colors for an Action Plan Task

task will fail. For example, if y_j is yellow, then $v(y_j)$ may be set equal to 0.5. This formula gives the true probability of action plan failure if the tasks are arranged in series and are statistically independent. For a series system, the implementation of the action plan is successful if and only if the implementation of each task within the plan is successful.

It is possible, however, that other circumstances might be present. For example, a set of tasks would form a parallel system when the success of the action plan requires only one of these tasks to be successful. Parallel tasks might be desirable for high-risk exploratory investigations. A given action plan might have a combination of series and parallel tasks. In addition, some tasks might be statistically dependent. Reliability theory has established bounds for these situations. First, if an action plan is coherent (which means that there are no irrelevant tasks), its failure probability cannot exceed the failure probability for all tasks arranged in series. Second, if the tasks are associated (which means they have non-negative covariances), an upper bound on the failure probability of a series system is obtained by treating the tasks as though they were independent. These two results, taken together, imply the above formula provides a rigorous upper bound on the true probability of action plan failure for any set of coherent, associated tasks. (1)

The evaluated probability P_{apf} serves as the measure of risk mitigation progress. The fifth and final step is to rank the risks with the Borda method, but using P_{apf} as one of the criteria instead of the probability of occurrence P_o for each risk having a specified action plan. If an action plan has not been specified for a particular risk, then the program will continue to use P_o as a criterion for that risk.

When applying the foregoing method, the user is responsible for only the first and second steps. After the tasks have been defined and status colors have been assessed, the program automatically carries out the remaining steps.

This tracking method provides several advantages. First, it enables the data and assessments collected for Risk Matrix to be used throughout the risk management process. According to the Defense Systems Management College (DSMC), the risk management process has four basic stages: risk planning, risk assessment, risk analysis, and risk handling. (3) The original Risk Matrix supports the first three stages; the software implementation, with the optional tracking method, supports the fourth stage (measuring risk handling progress).

Second, the risks whose action plans need the closest attention are identified with the Borda method. These critical risks are the ones whose P_{apf} and impact assessment (I) are both relatively high.

Third, if the status colors are assessed periodically (perhaps monthly) for all action plan tasks, both the Borda rank and P_{apf} for each risk can be plotted over time. These high-level graphical displays show the changes in the mitigation status of each risk during the risk-handling stage of the process.

Conclusion

Risk Matrix is a simple, easy to use, structured process that:

- Identifies which risks are most critical to the program, and therefore, most in need of resources.
- Facilitates discussions about requirements, technologies, and risks.
- Allows industry to be involved in the risk assessment and mitigation process early.
- Is a direct way of assessing and managing risk across the life of a program.
- Creates a historical record of program risk and mitigation approaches for deriving lessons learned.
- Is flexible and can be adapted to any project.

The Risk Matrix software application retains all features and capabilities of the original Risk Matrix, without requiring additional steps or data. Its new analytical features include:

- An Excel 5.0/Visual Basic implementation of Risk Matrix compatible on Macintosh and PC platforms.
- An intuitive graphical interface that displays risks by criticality (as illustrated in Table 5).
- Incorporation of the Borda method, a voting algorithm for ranking most-to-least critical risks on the basis of multiple evaluation criteria.
- A method for assessing and tracking risk mitigation action plan progress.
- A way to evaluate the sensitivity of risk rankings to specific evaluation criteria.
- Automatic sorting and charting capabilities.

Risk Matrix is put to use widely at ESC. The software application has been used by both the Joint Surveillance and Target Attack Radar System (JSTARS) and the National Airspace System (NAS) Upgrade program. In the spirit of T. Gilb, using Risk Matrix is one way to "actively attack risks before they actively attack you." (3)

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CAREER AND PERSONNEL INFORMATION

Civilian Career Management

Vital Information to Advance Your Career

The Logistics Civilian Career Enhancement Program (LCCEP) uses a Whole Person Score (WPS) as part of the merit process. Introduced in 1992 as a means of identifying top Air Force civilian logisticians, the WPS is used to determine if a career program registrant will be referred for consideration for competitive placement actions. These actions include promotion, reassignment, change-to-lower grade, and identification of a registrant for career development opportunities. The WPS is recomputed and updated monthly based on changes in a registrant's personnel data record.

Whole Person Scoring

Under Whole Person Scoring, 260 points are available for registrants competing for GS-9, 11, 12, and 13 covered positions or developmental opportunities. Registrants competing for covered positions at grades GS-14 and 15, or developmental opportunities that are allotted to these grades, have 460 points available to them.

WPS Updates

The WPS is automatically updated from information coded into the registrant's automated personnel record by their servicing Civilian Personnel Flight (CPF). A registrant may request a career brief from the servicing CPF when incorrect data is suspected or an annual review of the record is needed. Any corrections to personnel data record must be made by the servicing CPF.

When a registrant is promoted or reassigned, a new Air Force Form 2675, Civilian Career Program Registration and Personal Availability, is required to identify geographic locations (GEOLOC) desired, and to determine if the registrant is eligible for referral. Some important facts about GEOLOC include:

- GEOLOCs should be checked annually.
- The lowest acceptable grade must be indicated for each location. This is the third character of the six character GEOLOC.
- A registrant must include the GEOLOC for their current duty location to be considered for positions at that location.
- Some of the codes have been deleted with recent base closures. However, these codes may not necessarily have been deleted from your registration.
- A registrant should use the worldwide or area GEOLOC code to ensure adequate coverage of a geographic area desired. However, a GEOLOC area code may include installations scheduled to be closed. If a registrant does not want to be considered for assignment to an installation which is closing, the worldwide or area code should not be used. Referral and subsequent declination in this instance can lead to a penalty of non-referral to covered positions.

WPS Available on the Worldwide Web

A copy of the Individual Whole Person Score (WPS) review is available from the LCCEP WPS Website at http://www.afpc.af.mil/civ_car/lccep. The latest personnel career brief, a copy of the WPS Guide (from the LCCEP WPS Web Site), and the Civilian Training Guide for Career Programs (LCCEP Portion) (located at http://www.afpc.af.mil/civ_car), are also available. The WPS Guide covers how points are credited for each of the following elements: Experience, Education, Annual Appraisal, and Assessment. It also identifies the distribution of points for each element. A review of each element in the WPS with points less that the maximum points available provides a starting point to for improving whole person scores.

Improving WPS Scores

Some elements that can be improved are within the control of the individual registrant (such as academic education or professional military education). Other areas such as supervisory positions or positions at the same grade but in another series are within management's control. An example is to request reassignment to another work series. Securing management support is a large step in accomplishing the objective. Supervisors, along with the WPS Guide, can suggest ways to improve your scores.

The LCCEP WPS crediting scheme for formal education is designed to encourage a registrant to pursue education at the college level. Points are awarded progressively throughout a Bachelors degree program. As a result, a registrant can receive points for work completed as they move towards degree completion. LCCEP offers tuition assistance as well as long-term full-time training opportunities that lead to the completion of a degree program.

GS-11 (and above) registrants may enroll in Squadron Officer School (SOS) and/or Air Command and Staff College (ACSC), while Air War College is available to GS-13 (and above) registrants. The Headquarters Air Force Personnel Center Training Guide, available at the LCCEP web site, provides specific requirements for other available professional military education opportunities. Many of these courses are offered by correspondence and seminars, through local education offices, and in residence through LCCEP. Registrants desiring to attend in residence must request consideration through an established nomination and selection process. The Civilian Training Guide for Career Programs describes how registrants compete for courses in residence.

LCCEP also recognizes participation in the program for certification as a Certified Professional Logistician (CPL). Those who would like to pursue the CPL should contact their local chapter of the Society of Logistics Engineers (SOLE) for details.

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Logistics Professional Development

Mentoring : The Key Ingredient in Logistics Officer Professional Development

I see mentoring as a fundamental responsibility of all Air Force officers.

—General Ronald R. Fogleman

One of General Fogleman's legacies was the implementation of a formal mentoring program. While informal mentoring of one form or another has always been in place, General Fogleman realized a formal program did not exist to ensure all officers, especially "company graders," receive guidance from officers with more experience. As a result of his efforts, in 1996, Air Force Policy Directive 36-34, *Air Force Mentoring Program*, formally established mentoring in the Air Force and provided guidance for its implementation.

What is mentoring? The essence of mentoring is a relationship in which a person with greater experience helps guide personal and professional development of another individual. Why have mentoring? Mentoring is an essential ingredient in developing well-rounded, professional and competent future officers. Mentoring makes for a better Air Force by promoting leadership and professional development. However, mentoring is not a promotion enhancement program. It strengthens future leaders though personal involvement of supervisors and commanders, and it helps leaders create new leaders. The bottom line—it helps Air Force officers reach their full potential, thereby enhancing the overall professionalism of the officer corps.

Perhaps more so than any other career field, mentoring is key in a logistics officer's development. Proper mentorship helps young logistics officers prepare for the responsibilities they may assume during their careers. These include immediate opportunities (a second lieutenant in charge of a flight of 50 plus personnel) and long-range opportunities (a tour on a major staff, command of a logistics group, or assignment as program manager).

Commanders and supervisors, as part of the mentoring process, play an important role in guiding officers in picking and getting jobs consistent with not only their goals, but Air Force Officer Professional Development (OPD) goals as well. Through the Commanders Involvement Program, commanders can work together with the Logistics Officer Assignment Branch at the Air Force Personnel Center (AFPC) to focus their officers toward obtaining the right "next" assignment. The next assignment needs to enhance professional development while meeting Air Force requirements. The commander/supervisor should discuss assignment opportunities based on OPD needs and the officer's potential.

When looking at assignments throughout a career, it is important to seek a balance in professional development. There are three major areas to consider: functional expertise, proven leadership (such as command), and broadening (to include staff assignments and career broadening assignments). There are various opportunities at different times in a career to obtain these types of experiences.

The Logistics Officers Assignments Branch plays a major role in assisting commanders and supervisors in mentoring their officers. With guidance from the Air Staff, they serve as the "mouthpiece" when it comes to logistics OPD philosophy. The Logistics Officers Assignments Branch regularly counsels and advises officers on what their next logical career move should be. In addition, commanders and supervisors are in an excellent position to mentor subordinates on how they are doing in their current job and what career path would be best for them based on their potential. There are many forms of OPD counseling, for example, e-mail, fax, telephone, or "Spread the Word" trips. In addition, the following references are available on the AFPC Web Page (http://www.afpc.af.mil): Officer Career Path Guide, Acquisition Professional Development, Commander Involvement Orientation Program, Commander's Handbook on the Officer Assignment System, and the Officer's Handbook on the Officer Assignment System.

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U. S. Army Logistics Management College Joint Course on Logistics Changes

The Joint Course on Logistics (JCL), offered by the U.S. Army Logistics Management College, at Fort Lee, Virginia, has been reduced from 13 to 10 days effective 9 March 1998.

The JCL is a theater-focused course designed to prepare military officers and civilians to function in assignments involving joint logistics planning, interservice and multinational logistics support, and joint logistics in a theater of operations. To accomplish this, the JCL integrates component functional skills and knowledge through the study of strategy, doctrine, theory, programs and processes. The JCL provides the opportunity for students to develop the attributes, perspectives, and insights necessary to manage logistics at the operational level of war. The course material is unclassified. The course is for active duty and reserve component mid-level managers, (Maj and Lt Col or GS12-GS/GM14), assigned or en route to positions requiring joint logistics knowledge.

For additional information contact Lt Col Don Murvin (USAF) at the phone number or e-mail address listed below. To request a reservation through the Air Force Training Management System, the course code is L50ZA25L3-005. Army Logistics Management College information is available on the internet at www.almc.army.mil.

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Depot Operations Modeling Environment (DOME): A Collaborative Tool for Improving the Wing-to-Depot Logistics Process

Captain Frank W. Simcox, IV, USAF
Captain Joseph J. Romero, USAF
Samuel R. Kuper

Introduction

This article describes the technology development and demonstration opportunities associated with the Depot Operations Modeling Environment (DOME) research and development (R&D) effort. This effort is sponsored by the Sustainment Logistics Branch of the Air Force Research Laboratory, located at Wright-Patterson AFB, Ohio. The objective of DOME is to streamline wing-to-depot logistics processes through improved communication, collaboration, and process analysis. The potential payoffs of DOME include increased process understanding, improved wing-depot maintenance processes, and increased communication and understanding between Air Force depots and their wing customers.

The DOME effort can be characterized by three major tasks: (1) installation of a collaborative environment which links Air Force depots and wing customers, (2) developing a distributed process modeling tool and methodology that enables users at different sites to both develop and suggest improvements to shared processes, and (3) demonstrating DOME technologies centered on improving the Periodic Depot Maintenance process between Warner-Robins Air Logistics Center (WR-ALC), Robins AFB, Georgia, and Mt. Home AFB, Idaho. In addition to system development, a methodology for using the system will also be developed and tested.

Why DOME?

The competition for workload and the emphasis on cost cutting places considerable pressure on both base and depot-level logistics units to streamline their operations. Base logistics units want to ensure they are getting cost-effective and high quality service for their repair and maintenance dollars, and ALCs must ensure they are delivering the best value to their customers. Simply put, Air Force logistics units are confronted with the need to orient their business along "Lean Logistics" * lines in order to succeed in an increasingly competitive environment. Given the complexity of the effort and the significant risks and difficulties that are present in process redesign, the need for new methodologies and tools to support the long term design and implementation of Agile Logistics initiatives has become acute.

The tools and methodologies currently available have a number of significant limitations for Air Force logistics applications. Major limitations include weak support for performance measurement, low coordination with the strategic planning process, and lack of support for the coordination of group activities, whether collocated or distributed geographically.

Concept for a DOME System

The DOME effort is aimed at addressing some of the most critical problems faced by Air Force logistics-related process redesign efforts. To implement and improve Agile Logistics concepts requires increased communication and collaboration among the affected units. This leads to reduced risk in implementing such efforts, better identification of organizational issues, and increased user buy-in.

The DOME tool set is characterized by two main areas of functionality: group support systems and process modeling. The tool set will support any-time/any-place group collaboration through user-specific interfaces. It will enable different levels of users, such as senior managers, logistics and maintenance technicians, and engineers, to collaborate as appropriate, and enable users to work simultaneously on components of the same process model or on tasks at hand. Synchronous use of the group support and modeling tools will be complemented by shared audio and video capabilities provided through commercial software and hardware.

Group Support Systems

A group support system (GSS) is a computer-based environment to support concerted and coordinated efforts for joint problem solving and task completion. Participants type their contributions into computer workstations. The system immediately makes all contributions available to other participants on their workstations. A GSS can accommodate collocated and distributed groups working together on business redesign projects.

A GSS, specifically GroupSystems by Ventana Corporation, will provide the foundation for the development of the DOME tool set. The GroupSystems tools that will be used as part of the DOME effort will support the ALC and wing interactions. The tools in the standard GroupSystems tool kit include the following:

- "Categorizer" allows the group to generate a list of ideas and supporting comments. Categories are created for the ideas and participants can drag the ideas into a desired category.
- "Electronic Brainstorming" provides a process in which a question or issue is distributed to participants who respond with comments.

* The term Lean Logistics was recently renamed Agile Logistics. See "Reengineering Air Force Logistics" in this issue.

- "Topic Commenter" allows participants to comment on a list of topics. The format for idea generation is more structured than Electronic Brainstorming.
- "Vote" provides a variety of methods with which the group can evaluate a list of ideas. The results can be displayed in statistical and graphic formats.

Distributed Group Systems

The DOME project will leverage advances in operating systems and the Internet to use the GroupSystems tools in a distributed mode. Planning includes using the WinFrame software from CITRIX Systems, Inc. to enable distributed use of a GroupSystems session, allowing remote login from geographically separated team members via the World Wide Web. The traditional GroupSystems tools are used primarily for same time/same place meetings. The project stresses the development of processes and supporting technologies to guide facilitation in a distributed mode, including the application of artificial intelligence algorithms and easy to use templates.

Modeling Functions

The overall modeling objective of DOME is to provide support to help decision makers deal with complex situations. Modeling provides a well-defined environment to capture the structure of a given system as a collection of elementary components interacting with one another (that is, a model). A model essentially represents the inner working of an "as-is" or "to-be" system.

The architecture of the DOME modeling environment will have a central model-base to support archiving and reuse. This allows model development to be carried out by individuals focusing on distinct components of an overall system or process. For example, in case of an aircraft Programmed Depot Maintenance line, one could model the transportation process and another the maintenance process. This important feature is necessary for anytime/anyplace model development.

Expected Operational Environment

From a logistics perspective, a primary Air Force need is to facilitate transferring of current logistics processes into processes that support the tenets of Agile Logistics and Agile Combat Support. The most difficult situation arises when attempting to focus on customer requirements and the inclusion of distributed customers early on in process redesign and analysis. DOME will support input from quality offices, base level customers, senior management, and headquarters staff personnel, aiding in the definition of "to-be" models and process implementation without hindering day-to-day operations.

A typical DOME configuration will include group decision support rooms (Figure 1) linked via desktop and group room video conferencing systems, distributed modeling software, and group decision support software.

DOME use begins with the selection of a process to be described and improved (Figure 2, next page). First, Air Force personnel review their strategic goals and plans to identify those processes most important to their missions. They then obtain high-level support for the project and ensure personnel and resources are allocated to execute the DOME methodology.

Figure 1. Typical Group Support System Configuration

In the proposed demonstration of DOME, representatives from Mt. Home AFB and WR-ALC will examine the Aircraft Repair Enhancement (AREP) Program as it pertains to the Programmed Depot Maintenance process between those two sites. Discussions will be initiated with the project members and sponsors, including appropriate personnel and commanders at both wing and depot levels. GroupSystems will be used to conduct distributed briefings of the problems and possible process improvement benefits along with associated documentation. The participants will offer opinions and reactions using the distributed "topic commenter" tool, focusing on schedules and initial project assignments.

The process improvement (PI) effort begins after team members are identified and selected from important stakeholders involved. Important team roles include:

- Project sponsor(s), the senior leader who ensures the project has the necessary resources and is consistent and supports high-level goals and strategies.
- Project coordinator, responsible for executing the DOME methodology for the project lifetime, including GroupSystems initiation, document distribution, and team coordination.
- Base coordinators, responsible for DOME facilities and use at each location.
- Meeting facilitator, responsible for ensuring input from all stakeholders during each GroupSystems session, and for preserving and distributing the meeting minutes and results.
- Team members, must represent their facilities and constituencies during each GroupSystems session.

Note the roles will often be filled by the same person (for example, the project coordinator might serve as facilitator for some sessions).

Defining/Modeling the "As-Is" Process

The PI team's first task is to collect sufficient data to describe the current process, so comparisons may be made against any proposed process change. PI team members will describe those portions of the process with which they are familiar, and these

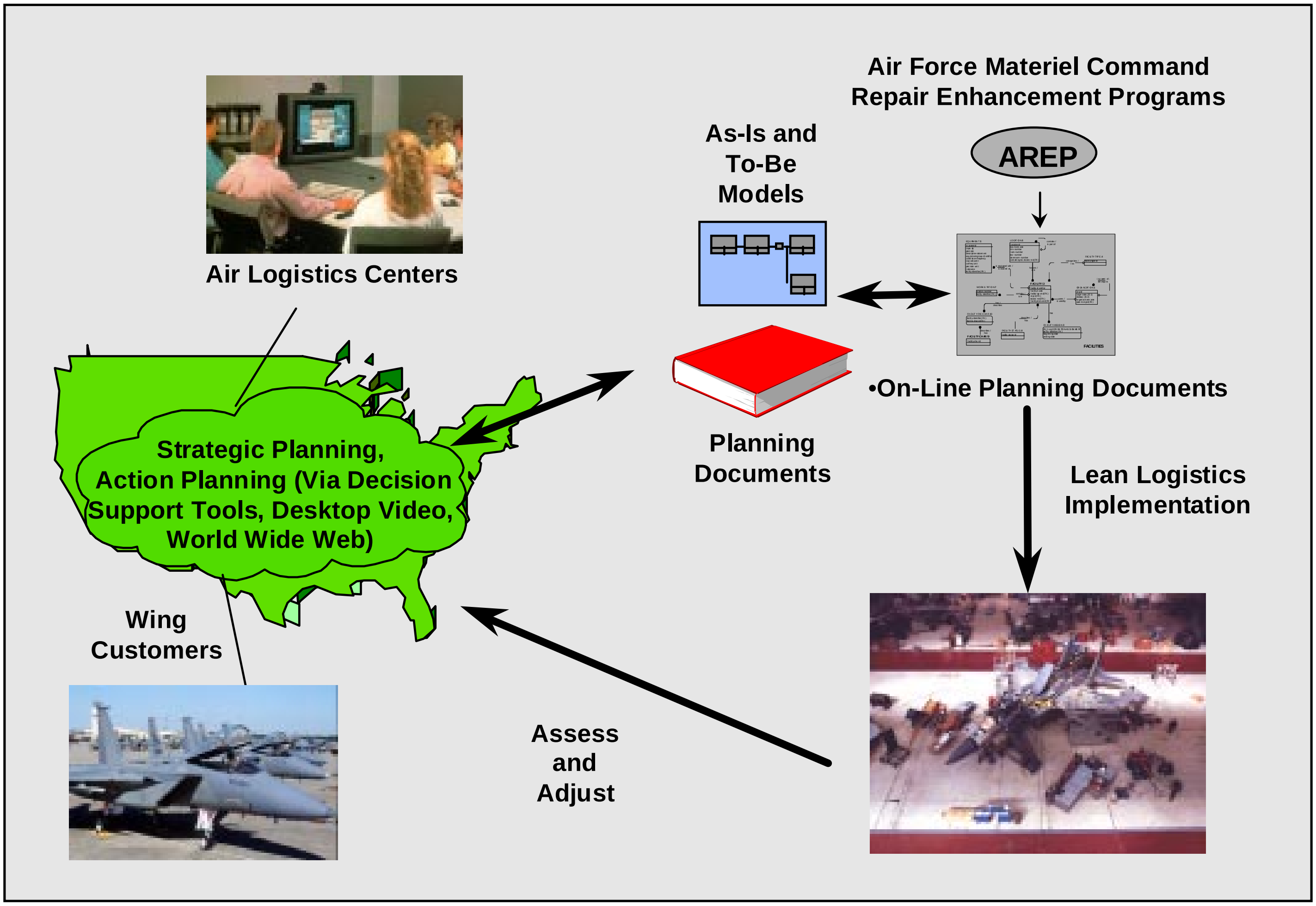

Figure 2. DOME Methodology

will be entered into the graphical process model by an analyst and/or meeting facilitator. The results of the graphical modeling are posted to a common site, as soon as they are completed, so they can be viewed and critiqued by the team members.

Although a significant portion of PI team members' time must be allocated to the PI effort, the anytime/anyplace nature of the DOME GroupSystems software means users need not be present for a single meeting, nor do they need to be electronically linked at the same time. Team members will be able to connect to the communication system, review the input of other team members, review the graphical process model, and comment on the model or provide additional input.

The graphical process model stores steps in the process, step ownership information, person assigned to the step, goals, constraints, data requirements, and metrics such as time to completion, success levels, and cost factors. The process model can be annotated with textual comments, pictures, maps, and video clips as needed. The model will be hierarchical in nature, so the process can be viewed from a high functional level or at the level of individual workers. Information will be searchable across the model and across hierarchical layers. Creating process models allows cross-functional groups to share complex information in a structured manner. The teams will rely on the GroupSystems tools to define terminology, query users, and identify model requirements. The model will provide a visual representation of current processes that can be evaluated via distributed GroupSystems meetings. The application of a collaborative process modeler for distributed use is novel. Therefore, issues of facilitation and management of procedures are of great importance to the DOME team.

Later, comparison of the "as-is" process (for example, aircraft records transfer) and its candidate replacement can be carried out. This comparison would be in terms of metrics related to performance measures such as throughput and cycle time.

Defining "To-Be" Processes

A typical "to-be" modeling effort would start with copying the "as-is" graphical model, and then generating ideas to transform it into the "to-be" model. Alternative versions of the "to-be" models can be generated as various "what-if" scenarios are elaborated, and then recombined as the scenarios are adopted team-wide. Discussions of the effects of changes can be held on-line, and annotations from these discussions included in the graphical model to encourage input from all participants.

The demonstration involves brainstorming improvements across the documented process, including:

- Better means to transport the information from wing to depot.
- Coordinating the goals of the disparate groups (for example, are the day-to-day success measures of the depot personnel synchronized with those of the wing?).

- Paralleling the dissemination of information from the wing to depot (for example, are there excessive or duplicate interactions between functions?).
- Adding feedback and checkpoints that raise the visibility of the process steps to the wing.

Team members will review the "as-is" process, looking for steps that would benefit from new technology, steps having duplication of effort or lack of coordination, steps that could be paralleled, and steps that could yield benefits when tracked. The changes will be entered into a GroupSystems session and discussed, comparing against higher-level goals and other organizational priorities.

As changes are suggested, possible "to-be" models can be created, similar to a "save-as" function in a word processor.

Implementing the Selected "To-Be" Process

DOME will aid in the implementation of the new process by preserving the process model, the measures of its success, and the reasons for its selection. The process model will aid in the planning for manpower, training, and information system requirements in the new process, can serve as references for functional and worker duties, and serve as a blueprint for implementing the new process.

The communication facilities of DOME link team members involved in the actual implementation effort so they can continue to discuss issues, review performance against projected measurements and change the model if needed. In some cases, the video conferencing and electronic communication infrastructure supporting DOME can also be used in the process itself, as in displaying parts and repair status across the world, or discussing problem areas and moving toward agreement on responses.

DOME Status

Currently work is under way to establish the required architecture and group decision support tools, and prepare for the demonstration at the Warner Robins ALC and the 366th Wing at Mt. Home AFB. The DOME tools are being designed for use by Air Force logisticians at the wing and depot.

The end result of the DOME effort will be a set of design tools that enable process definition and modeling across organization and geographical boundaries. Due to current interests in collaborative technologies and distributed support for communication, the DOME tools are expected to be applicable for other Air Force projects and initiatives. The flexibility of the tools will permit them to support a variety of tasks.

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The authors wish to extend a special thanks to the following individuals: Mr. Abe Banks, Warner Robins ALC Reengineering Directorate, Mr. Rick Brown, Dr. Jim Lee, Ms. Melissa Glynn, Dr. Ram Nidumolu, Dr. Jay Nunamaker, Mr. Hessam Sarjoughian, Dr. Sam Vahie, Dr. Doug Vogel, and Dr. Bernard Ziegler, from the University of Arizona.

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board's Secretariat. The board membership consisted of retired Air Force senior logisticians, commercial representatives, and senior logisticians from other services. The board assessed the Air Force's supply chain management process and proposed strategic changes that can be implemented in 12 to 24 months. SAO also assisted AFMC/LG in quantifying the recoverable item bow wave for buy and repair and helped develop a questionnaire sent to the centers to identify their primary supply chain management constraints on important readiness items. SAO analyzed program, supply, and maintenance data to help prepare the presentation for CORONA SOUTH. (Analysts: Vic Presutti, Curt Neumann, Bill Morgan, Mike Niklas, Bob McCormick, DSN 787-3201)

The Program for 1998

In 1998 SAO plans to continue to devote a major portion of their effort toward implementing new methods for improving the management of weapon system spare parts. This will include methods to determine requirements, allocate resources, execute support actions, and assess impact. Some specific areas on which we will focus:

- Support and enhance the Readiness Based Leveling system.
- Implement Forward-Looking RBL.
- Develop decision tools to help manage to unit cost targets.
- Explore the application of EXPRESS for repair planning and funding allocation.
- Complete solutions for multiple sources of repair and consolidated intermediate repair.
- Evaluate demand-forecasting techniques for engine components.
- Enhance the cost-benefit analysis tool that helps identify when it is economical to increase contract repair responsiveness.
- Deliver a readiness based sparing model to the Supply Support Integrated Process Team charged with developing an initial requirements determination process for new weapon systems.
- Implement the procedure for assessing peacetime and wartime capability based on prioritized depot repair and distribution.
- Evaluate the method AFMC uses to compute spares requirements for aircraft engine components.
- Provide an information system that will help AFMC monitor its responsiveness to customer demands.

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Pitfalls and Pathways in Outsourcing

Lieutenant Colonel Eric M. Hodges, USAF

Outsourcing—that word that strikes terror, concern, or skepticism into the hearts of almost everyone. Virtually every Air Force support career series must take seriously the implications involved with an outsourcing initiative. There are many misconceptions regarding this program that need to be better understood and put to rest. There are also many realities associated with outsourcing that require all of us to become more familiar with the program and step out to make it workable.

There is no question regarding the program's viability and continuing impact in the Department of Defense (DoD). Virtually every issue of *Air Force Times* has an article hitting on past, current, or future outsourcing actions. In the Department of Defense Logistics Strategic Plan signed on 22 June 1996, Mr. Paul G. Kaminski stated "Outsourcing is a key tool within the Department's efforts to reengineer logistics business processes." He went on to set out some specific measures in the depot maintenance, material management, and other operational support areas. All of these are measured for success based on their associated cost reductions.

Clearly, outsourcing has not been a bed of roses, unless you recognize the associated "thorns" that may be present. The cover story of the 25 August 1997 issue of the *Air Force Times* discusses some of the concerns of the massive maintenance outsourcing initiatives pursued at some of the flight training bases. One of the articles in the issue highlights maintenance problems at Altus AFB caused by the lack of government civil service personnel to do the job. A significant portion of the problems stemmed from a poor transition to the "new civil service force." Another story examines the pilot training that came to a halt at Sheppard AFB because of a contractor strike. This was a new concept to the Air Force since "blue suiters" do not walk off the job. However, the articles also highlight some of the advantages of contractor run operations. Specifically, they site the continuity and experience level contractors bring to the maintenance operation—up to 25 years of maintenance experience for some of the aircraft.

With the drive to outsource and privatize functions in the DoD, commanders must change their traditional thinking about working with contractors. The old mental image of the contractor being an "outsider" who must be told no only what to do, but also how to do the job, is history. Today's environment requires commanders to actively partner with contractors. Partnering means establishing a relationship in which both parties share risks, savings, and rewards. In short, both the government and the contractor need to understand the benefits of establishing a long-term relationship based on mutual respect, trust, and concern for the missions.

Partnering starts at the beginning of the solicitation process and runs through the life of the contract. The first step in the process is to clearly define the performance requirements in a document referred to as the Performance Work Statement (PWS). DoD agencies can benefit from holding industry roundtables, workshops, or draft solicitations meetings to allow private industry to share their experience and comment on our requirements.

The PWS is the heart and sole of every outsourcing initiative. Whether the activity is ultimately performed by government or contractor personnel becomes a mute point since both organizations are required to adhere to the work effort outlined in the PWS. When developing the PWS, functional experts must clearly and specifically address all activities to be performed. It is important to highlight here the necessity of the PWS specifying "what" buy not "how" to do the work. Providing detailed direction on how to perform the tasks removes the initiative and ability of the bidders to develop a truly effective or innovative method of operation. Conversely, broad, generalized statements of need or end objective are not sufficient enough to ensure the specific services required by the government are obtained.

Managers must also decide what is the best method of inspection to be used to check on the contractor's performance (for example, 100% review, random sample, or periodic inspection). Choosing the type of inspection should relate to the nature of the task and the level of acceptable risk. The PWS needs to provide the contractor with the flexibility to implement best business practices. Many contractors reorganize the work area to combine similar functions and require employees to perform cross-functional skills to improve efficiency and reduce costs. Building a quality performance-oriented PWS takes time, but when properly written, provides the flexibility to private industry to truly reengineer our processes.

Next to developing a solid PWS, the proper evaluation and selection of a contractor become the most important steps. Use of past performance as a discriminator on future awards is a big motivator for contractors. In previous years, contractors generally had to be debarred or suspended before you could effectively exclude them from participating in the bidding process. Recent legislative changes now not only make it possible, but encourage contracting officers to make past performance a specific evaluation criteria. The government is no longer in the "lowest bid" mentality. True, we still want to pay the best price available for a given product. However, if past performance shows the products provided by a given contractor have not been of high quality, we can now drop them from award consideration.

Finally, we need to decide what contract type fits the requirement. Where it makes sense, contractors should be incentivized to exceed our expectation by achieving greater cost savings or exceeding other performance goals. Generally, award fee and incentive type contracts are used in more technical areas—where performance is crucial and risk to the mission is too high. These types of contracts motivate contractors to exceed our expectations through incorporation of best business practices, process improvements, and possible capital improvements. An open dialog between the functional managers and contracting specialists will help sort out what type of contract is the best choice for a given activity. While the most common type of contract in the government is firm fixed price, we should, on a case-by-case basis, review whether this is the best arrangement for the government.

Table 1 summarizes the new interface strategies when dealing with a contractor. While the new strategies are easy to understand, they are difficult to implement because old concepts and prejudices must be unlearned. Commanders must not only educate their work force in the new concepts, but also ensure these concepts are implemented in their daily work practices. Partnering with private industry must become the norm rather than the exception.

Possibly, the greatest skepticism is tied to the potential increases in cost following contract award. The responsible functional commanders need to ensure they control the costs. Generally costs raise from one of three reasons: first, as wage determinations change, the cost of the contract also changes; second, valid work changes because of change in requirements not anticipated in the PWS, a modification to the contract is made and negotiated with the contractor; and third, changes because of incomplete or inaccurate PWSs. The first two are generally considered legitimate reasons for increased costs. What we need to watch out for are changes in the third category. At times, these are creeps in contract requirements for support above and beyond that which is required for mission support. For instance, if the Air Force standard downtime for maintenance for a given aircraft is five hours per week, and the new maintenance chief wants the contractor to take it down to three hours per week, the contractor will exact a significant payment to meet that direction. Other times, the lack of experienced PWS developers may result in key functions being overlooked and not included in the PWS. Active involvement of senior level managers is critical to ensure key operational support is properly identified in the PWS and to control the resulting cost increases.

In summary, successful commanders will foster an environment of cooperation, trust, and respect with contractors to leverage private industry's best business practices. Managers at all levels must write better performance work statements that are output-oriented rather than task-based. Contracts need to motivate contractors to exceed our expectations rather than just meet them. Armed with this knowledge and perspective, DoD can start the partnering process. The private sector has already learned these partnering behaviors—now DoD members have to understand them, accept them, and apply them.

Lieutenant Colonel Hodges is presently the Chief, Outsourcing and Privatization Branch, Contracting Division, Headquarters Air Force Space Command, Peterson AFB, Colorado.

Old Concept	New Concept	Benefits
Excessive requirements	Realistic mission needs	Saves costs and provides level of service required by mission
Tell the contractor how to do the work	Tell the contractor the work that needs to be done, not how to perform it	Gives contractor flexibility to incorporate "best business" practices and improve processes
No/little industry input	Industry roundtable/conference	Clarifies requirements; provides useful industry feedback on improving the solicitation
Distrustful	Trust and respect	Acknowledges contractors are truly concerned with reducing costs, improving processes, and providing quality service
"Us-them" perspective	"Win - win" attitude	Promotes teaming, trust, and quality
Low bid	Low bid technically acceptable or best value contracting	Ensures contractor is capable of performing the requirements and allows source selection authority to consider quality improvements against cost
Single function contracts	Multifunction contracts	Reduces contract administration overhead costs and provides commanders single belly button
Penalties for non-compliance	Award incentives to promote greater efficiencies	Positive reinforcement vice punishment fosters contractors performance
Monitor (oversight)	Partner/team with contractor (insight)	Frequent communication with contractor resolves problems early; partnering capitalizes on the best business practices—acknowledges symbiotic relationship between contractor and government

Table 1. Interfacing With Contractors

Logistics Officer Training Program (LOTP)

Second Lieutenant Heather M. Rice, USAF

The 49th Fighter Wing developed the Logistics Officer Training Program (LOTP) at Holloman AFB, New Mexico, to provide newly-assigned logistics officers a well-rounded overview of squadron-level logistics, before beginning their initial assignment. The LOTP allows new officers to become acquainted with the many facets of logistics and develop a better understanding of how logistics systems work at base level.

LOTP has three phases: introduction, orientation, and follow-on training. The program's bedrock is the orientation phase. Modeled after the wing Air Combat Command (ACC) Maintenance Officer Training Program (MOTP), this phase of training is augmented by training from the Transportation Squadron, Contracting Squadron, Supply Squadron, 48th Rescue Squadron, and the Materiel Maintenance Group. The length of the first two phases of the LOTP does not exceed 60 workdays. Officers are assigned to the Maintenance Training Flight during the first two phases, then transition into their new squadrons and attend their respective technical school training when it is scheduled. After formal technical training, the officers return to their assigned squadron. The key to LOTP is flexibility, and the classes and orientations are scheduled to meet both personal and unit needs. If the officer must attend technical school before completing LOTP, the program will be finished when the officer returns. The program is also available to lieutenants and captains who do not have the required Combat Air Force background and who could benefit from the extensive orientation provided by LOTP. Each student continues with advanced training through the local Maintenance Training Flight and/or Training Detachment courses.

Phase I - Right Start. Right Start is a full orientation program that lasts for 14 workdays. During Right Start, officers attend the Logistics Group and Operations Group Right Start Programs. Each of these programs provides a brief overview outlining how these groups function and how their respective squadrons are integrated in support of the overall wing mission. Unit Training Code (UTC) related courses, Core Values Training, and Total Quality Management Training are all scheduled events that are completed by Right Start. Once Phase I has been successfully completed, the officer is ready to enter Phase II.

Phase II. During this phase, the officers observe and discuss the many facets of logistics with functional experts. They visit with units in the wing to gain an insight into the daily routine and requirements that must be met. The maintenance observation is modeled after the MOTP (covered by ACC Instruction 36-2251, Chapter 6) and is held in Operations Group and the Logistics Group maintenance units. Officers receive a breakdown of flight responsibilities for both squadron operations and maintenance. Other areas of observations include the Wing Safety Office and the security forces that are already an acting part of the MOTP. After viewing these areas, the officer continues to the Transportation Squadron, the Contracting Squadron, the Supply Squadron, the 48th Rescue Squadron, and the Materiel Maintenance Group.

While in the Transportation Squadron, focus is placed on vehicle management, maintenance areas, and traffic management decision making. The officer also attends load planning, hazardous cargo preparation, and in-check courses.

The Contracting Squadron familiarizes the officers with the role of the contracting office in support of the daily and wing deployment operations. This includes contracting activities which range from normal commodities, services, and construction, to highly complex contracts for operations and support of aircraft maintenance and support for several labs and test organizations.

The Supply Squadron provides the necessary overview of the key supply processes. These processes include an orientation of materiel storage and distribution, fuels management, combat operations, management and systems, and any future initiatives found in the supply arena.

The 48th Rescue Squadron is a valuable bonus to the officers. The squadron conducts worldwide combat rescue missions utilizing HH-60 helicopters during wartime or contingency taskings and conducts peacetime search and rescue and medevacs serving the National Search and Rescue Plan. This squadron shows the importance of the HH-60 helicopter in rescue missions and assistance to allied countries.

The Materiel Maintenance Group is responsible for the storage, inspection, repair, deployment, and accountability of bare base assets belonging to ACC and the United States Central Command Air Forces (USCENTAF). The Materiel Maintenance Group keeps this equipment in a high state of readiness to support worldwide contingencies, both wartime and peacetime. Materiel Maintenance Group observations enable the officers to understand the role it plays in worldwide contingencies and their provisions for deployment assignments. Once Phase II has been completed, the officers begin their duties in their assigned squadron until they attend technical school.

Phase III. Phase III of the LOTP includes courses that can be attended by logistics officers after they complete technical school training and gain some logistics experience. Some flight line familiarization is required to successfully complete several of the courses being offered. Phase III courses include: Mission Ready Technician, Avionics, Dedicated Crew Chief, Aircraft Maintenance Officer System Training, Engine Run Certification, Aircraft Mishap Investigation Course, Jet Engine Mishap Investigation Course, ACC schoolhouse, and Air Force Institute of Technology (AFIT).

The Mission Ready Technician Course targets apprentice-level personnel assigned to the F-117 stealth fighter as their first airframe. The course covers the theory of operation of airframe, hydraulic system components, and the F404 engine. The hands-on portion of the course covers ground handling, servicing, inspections, and launch and recovery. The Avionics course prepares apprentice-level personnel to understand the theory of operation and procedure for the removal and replacement of aircraft components. This course covers all avionics systems installed aboard the F-117 aircraft. The Dedicated Crew Chief course familiarizes maintenance personnel with topics that include Combat-Oriented Maintenance Organization, Combat-Oriented Supply Organization, scheduling, forms documentation, aircraft appearance, flight line safety, hangar queen policy, Core Automated Maintenance System, and Foreign Object Damage. Aircraft Maintenance Officer System Training is designed to familiarize newly assigned maintenance officers and senior noncommissioned officers with the major systems, maintenance practice, and procedures associated with the F-117 aircraft. The Engine Run Certification course covers ground operation of the F404 engine. It is designed to certify craftsmen-level maintenance technicians in the ground operations of the F404 engines. The Aircraft Mishap Investigation Course (AMIC) teaches the maintenance officer about what characteristics to look for during aircraft mishaps and the causes leading up to the time of the actual mishap. The Jet Engine Mishap Investigation Course (JEMIC) is designed to teach the maintenance officers the same concepts as that of AMIC, but is geared towards jet engines.

All of these courses, except for the ACC "schoolhouse courses," are maintenance related and are geared for the maintenance officers. They are taught at Holloman except for the ACC, AFIT, AMIC, and JEMIC courses. These programs are attended on a temporary duty (TDY) basis and are reserved ahead of schedule to ensure the availability of slots. The ACC schoolhouse course provides an in-depth look at aircraft maintenance concerns. These areas range from flight line organization and leadership to aircraft generation. Two AFIT courses are part of the program curriculum: WLOG 199, Introduction to Logistics, and WLOG 262, Applied Maintenance Management Concepts. WLOG 199 is an entry-level logistics course. WLOG 262 focuses on maintenance management and decision making. All course requirements are outlined in the student LOTP handbook.

All students are provided a LOTP handbook as an information resource. It contains a variety of direct and supplementary information.

LOTP could easily be implemented in other logistics groups. It is adaptable and the 49th Wing has a library of the material used in the program. Other bases and wings can easily tailor the program to meet their need or particular interest. The LOTP is a proven program that helps produce well-rounded logisticians earlier in their careers regardless of Air Force Specialty Code (AFSC).

Lieutenant Rice is presently the Chief, Maintenance Training Flight, 49th Logistics Support Squadron, Holloman AFB, New Mexico.

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6. Lansdowne, Zachary F., and Beverly S. Woodward, "Applying the Borda Ranking Method," *Air Force Journal of Logistics*, Vol. 20, No. 2 (Spring 96), pp. 27-29.

Paul Garvey and Zachary Lansdowne are presently at the Economic and Decision Analysis Center, The MITRE Corporation, Bedford, Massachusetts.

The authors wish to recognize the fine contributions of the Risk Matrix application development team at The MITRE Corporation. These persons include John A. Wilson, who led the software development, and project contributors James F. Hill (NAS), Catherine W. Kimball (JSTARS), and William L. Parlee (JSTARS).

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The Royal Flying Corps Logistic Organisation

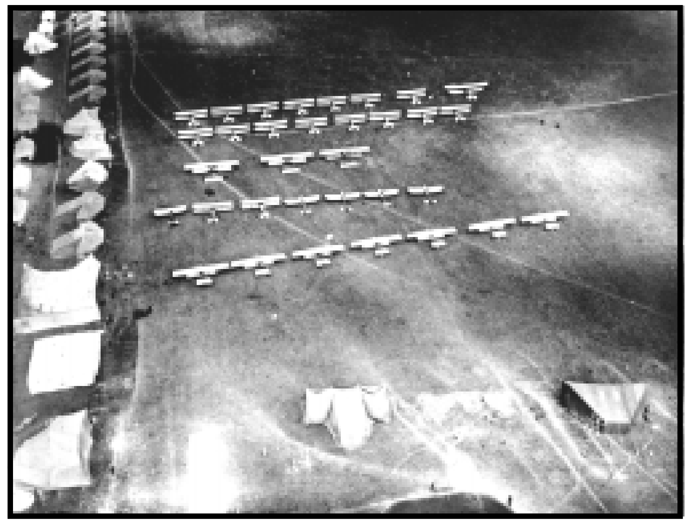
Group Captain Peter J. Dye, RAF

It is perhaps difficult, at this distance, to appreciate just how novel the aeroplane was when the Royal Flying Corps (RFC) was formed on 13 May 1912. And yet, within a little over six years, it would form the basis for the world's first independent air force; and reportedly the world's largest with some 23,000 aircraft and 300,000 personnel. Many of those attributes now associated with air power were first demonstrated by the RFC, even before the war started, in a series of pioneering exercises and trials. In this presentation, I shall be concentrating on the logistic organisation developed by the RFC and, in particular, the support of deployed operations in France between 1914 and 1918.

From its inception, the RFC was intended to be employed in direct support of the Navy and the Army. Not only was the organisation of the Military Wing of the RFC tailored for deployed operations alongside the Expeditionary Force, but the flight and squadron system was specifically chosen to provide for flexibility and ease of handling in the field. Each squadron—comprising three flights of four aeroplanes and a headquarters flight—was to be a homogeneous unit, with its own field repair, stores, and transport services, and self-contained and could be detached for short periods. This organisation survived the test of two world wars and is still recognisable today. [1]

The early aeroplanes were delicate, fragile, and unreliable. Their integrity deteriorated rapidly when exposed to the elements such that hangarage was essential to provide protection for both machines and mechanics. The technologies involved were extremely high for the time, demanding skills and equipment that were not readily available. Engine lives were short, requiring thorough overhaul after a comparatively brief period. Effective support was made all the more difficult by the proliferation of aircraft and engine types and the lack of standard components. To enable the squadrons to function effectively in the field, the logistic organisation had to be mobile and self-contained, although it was also recognised that, even with these arrangements, only a proportion of aircraft would be available for operations. [2]

The key was motor transport—itself a fledgling technology. By the time of the Military Wing's famous Concentration Camp at Netheravon in June 1914, each squadron had a wartime establishment of 26 lorries and tenders, together with 6 motorcycles and trailers. [3] The need for these vehicles had been clearly demonstrated in successive exercises; but peacetime affordability was the main issue. [4] A novel scheme was therefore introduced, at the behest of the Treasury, under which up to half of the lorries was provided by subsidy. This operated on the basis of a grant (£50 towards purchase and £20 per annum for maintenance to agreed standards) paid to participating firms with the understanding that in an emergency the Army would purchase the vehicle for full-time use. When war was declared, there were over 1,000 vehicles registered under the scheme, many of which were destined for the RFC and subsequently appeared in France still sporting their commercial colours; including No. 5 Squadron's infamous brilliant scarlet lorry, previously operated by Maple's store, advertising *"'HP' Sauce - The World's Appetiser."* Not surprisingly, such incongruous sights fostered the belief that the RFC was woefully prepared for war. In fact, it was evidence of an innovative and pragmatic solution to that perennial problem—matching resources to needs. [5]



Aircraft of the Royal Flying Corps at the Netheravon "Concentration Camp" in June 1914.

Even before the war, it was recognised that squadrons could not support themselves for more than a limited period in the field and that a facility was required—close to the Army's operations—capable of undertaking a greater depth of repair and holding a wide range of spares and equipment. These needs were met by a Line of Communications Workshop which became known as the Flying Depot, and later the Aircraft Park, based at Farnborough and comprising separate stores and workshop sections capable of packing up and moving in 24 hours. On the outbreak of war, the Aircraft Park deployed to France to support the squadrons in the field, arriving at Boulogne on 18 August 1914. [6] The Official History records that, on disembarkation, the port landing officer sent a urgent wire to General Headquarters: "An unnumbered unit without aeroplanes which calls itself an Aircraft Park has arrived. What are we to do with it?" Despite this initial hiccup, the Aircraft Park proved itself invaluable in sustaining the four deployed RFC squadrons. It was, in effect, their travelling base and as such was constantly on the move. Eventually, at the end of October, after five changes in location, the Aircraft Park found itself at St Omer where it would remain for much of the war. [7]

By the end of 1914, the system for the supply of materiel to the squadrons in the field was as depicted in Figure 1. Two aspects are worthy of note. First, a considerable quantity of materiel was purchased directly in France and delivered to the Air Park for formal acceptance and issue. This included aircraft as well as engines, wireless equipment, and a wide range of aeronautical stores. Such was the urgency of the RFC's needs that, in the first six months of the war, 100 complete aircraft were purchased from French manufacturers, part of a total of 1,500 airframes of various types purchased in France during the course of the war. The employment of these aircraft and associated equipment, whilst of significant operational benefit, considerably complicated the Aircraft Park's logistic efforts, particularly the interchangeability (or lack of it) between British and French-sourced components. [8]

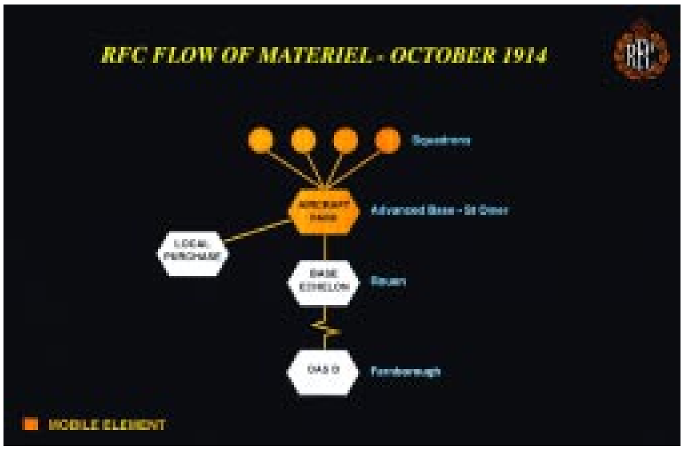
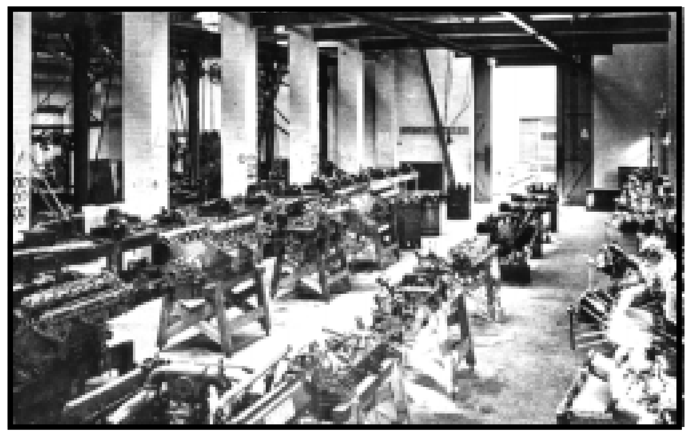


Figure 1. Royal Flying Corps Flow of Materiel - October 1914

The second point I would make, is that all other stores for the Air Park were issued by the Ordnance Aeronautical Stores Department (OASD), part of the Army Ordnance Department, based at Farnborough. Their supplies were obtained either by direct purchase or from the Royal Aircraft Factory. [9] The increasing range and quantities of materiel that had to be handled led to the setting up of a dedicated stores depot in October 1914 to hold aircraft, engines, pyrotechnics, and all stores special to the RFC. Almost immediately, the buildings at Farnborough proved inadequate to the task and additional stores were established at Greenwich and Didcot; the first elements in a stores distribution system that would ultimately comprise seven main depots and ten distributing parks in the United Kingdom alone. I should add that the situation at Farnborough was not made any easier by the requirement that all aircraft purchased for the RFC had to be flown there, or delivered crated and then erected, for inspection and flight testing by the Aeronautical Inspection Department (AID). This potential bottleneck remained until March 1915 when regional delivery centres were opened. [10]

As the war grew in scale and intensity, ever greater human and materiel resources were needed to sustain the RFC in the field. The growth in the number of frontline squadrons, the increasing complexity of aircraft and their supporting equipment and the rapid rise in wastage through accidents or combat losses, placed the existing logistic organisation under considerable strain. The Aircraft Park itself came to resemble, in the words of its commander, "a gigantic factory and emporium," repairing everything from aircraft to wireless equipment and vehicles. The range and quantity of spares to be handled created immense difficulties. The stores section alone was responsible for requisitions ranging from complete aircraft to horserakes and lawnmowers for keeping aerodromes trim. As a result, by July 1915, the Aircraft Park had become just too unwieldy to satisfy the demands placed upon it and thus a second park was established at Candas to cater for those squadrons working directly for the newly formed Third Army. [11] Both parks were supplied by rail from separate port depots, based respectively at Boulogne and Rouen, which received all the RFC's stores from England. In due course, the Rouen base become a huge engineering complex that included the RFC's Engine Repair Shops (ERSs) at Pont de l'Arche which, by the summer of 1917, would comprise over 1,700 personnel employed in the overhaul and repair (O/R) of engines from every squadron on the Western Front. [12] Repairs were also carried out by civilian contractors, but the bulk of arisings were placed in Service repair shops in order to avoid persistent labour and production problems in the United Kingdom. [13]



The bulk of engine repair was undertaken by the Royal Flying Corps in order to avoid persistent labour and production problems in the United Kingdom.

Even with these changes, it was evident that unless the parks were relieved of some of their heavy repair work and the vast range of stores they were now required to hold, there was no possibility they could sustain a mobile role. The elegant solution was to create new air parks for each RFC brigade and to convert the original air parks into fixed supply and repair depots. The individual air parks were kept as small as possible, comprising some 150 personnel organised into separate repair, stores, and transport sections, and based in the rear of the Army area, adjacent to a railhead to enable a rapid move if required. In turn, the depots comprised some 500 to 1,000 personnel, depending upon the number of squadrons to be supported, organised into a wide range of repair and stores sections. [14] Consumables, such as ordnance, petrol, rations, clothing, and so on, were provided by a combination of Army supply, specific RFC arrangements, and local purchase. In the case of aviation spirit, this was provided in two and four-gallon cans direct from England, using the Army supply system, although the quantities—600,000 gallons per month—were such that by early 1918, filling arrangements were provided in France. [15]

By June 1916, and the Battle of the Somme, the logistic organisation had expanded to support over 400 aircraft in the field, as shown in Figure 2 on the following page. The bulk of

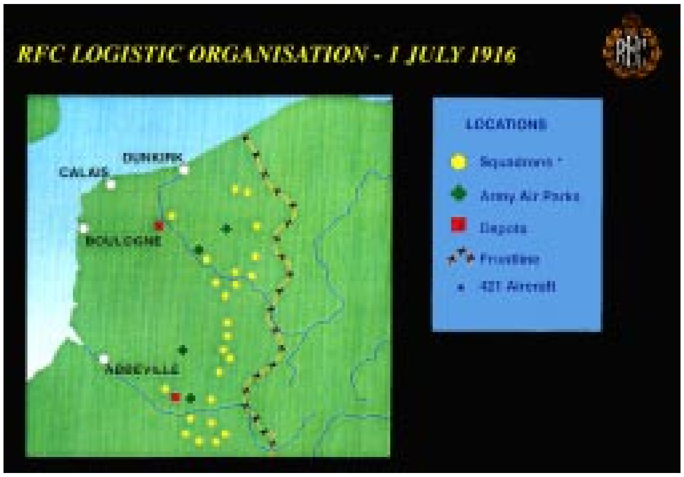


Figure 2. Royal Flying Corps Logistic Organisation - July 1916

The importance of salvage and repair cannot be exaggerated. Every aircraft and engine that could be repaired or rebuilt helped offset massive losses and sustain operations.

the operational squadrons were based six to eight miles from the frontline. The air parks, responsible for day to day support of the squadrons and holding one month's supply of aeronautical stores, were located at railheads some five to ten miles further back. The parks' stock holdings were strictly controlled to ensure mobility was not impaired and all stores were packed in specially constructed cases that could be readily loaded onto lorries and issued, if necessary, "on the move." Minor facilities, for example to conduct wing repairs, were provided, but they were first and foremost issuing centres. The parks were supplied in turn by the two main depots, up to 40 miles from the frontline, each with three month's stock of aeronautical and transport stores. The depots also received, and issued direct to the individual squadrons, new aircraft, maintained an attrition reserve, and overhauled and rebuilt aircraft, balloons, transport, and associated equipment. All aircraft and engines requiring repair outside squadron capabilities (assessed as in excess of 36 hours) were returned direct to the depots, as were all wrecked aircraft. [16] In theory, because of their size and extensive facilities, the depots were static. But, when the Germans threatened to break through to the Channel ports in 1918, both depots were moved as a precaution—not without difficulty—some 20-30 miles to the west, where they remained until the war was over.

The importance of salvage and repair cannot be exaggerated. Wastage rates at the beginning of the war were relatively low, about 10% per month, however by June 1916 it had reached 48% per month, rising to a staggering 65% during the course of the Battle of the Somme. In July 1917, it was calculated that to keep 1,800 aircraft in the field (approximately the size of the Royal Air Force in France at the Armistice), 1,500 aircraft would have to be provided each month. [17] Every aircraft that could be repaired or rebuilt and every component or engine that could be salvaged helped to offset these massive losses and sustain the RFC's operations. [18]

In parallel with these developments, it had become abundantly clear that specialist officers were required to oversee the RFC's technical needs, both to supervise stores and to manage the repair and overhaul of aircraft and equipment. In fact, to find flying officers for such duties, when the lack of trained pilots was a severe constraint on the RFC's expansion plans, was simply not possible. As a result, equipment officers had been introduced from early 1915 and by July were to be found in all wings and squadrons in France. [19] Their duties embraced what would now be called the engineer and supply disciplines. The arrival of equipment officers took much of the technical burden off the squadron commander's shoulders giving him more time to concentrate on operational matters. In fact, on some squadrons, such as those employed in Corps duties (Army co-operation), there were eventually up to four equipment officers on the establishment. [20] Their overall importance is indicated by the fact that, in a little over a year (that is by July 1916), nearly 400 of the 2,000 officers in the RFC were graded as equipment officers—about 20% of the total strength.

I have already alluded to the shortfalls in the delivery of equipment, made good by direct purchases in France. In the course of the war, over 55,000 airframes and 41,000 aero-engines were produced by British industry, primarily for use by the RFC and Royal Naval Air Service. This achievement is all the more impressive when one recalls that, at the outbreak of war, there was practically no aero-engine industry and a total of only eight aircraft contractors. This massive expansion in production inevitably created problems, ranging from dilution of skilled labour to shortages of critical components. Even so, by July 1916 deliveries to the RFC had reached 120 aircraft per month, rising to an average of 1,300 per month in 1917 and 2,700 in 1918. Completed aircraft were sent directly from the manufacturer to a system of Aircraft Acceptance Parks, developed from the regional acceptance centres described earlier, but controlled by the RFC from March 1917 onwards. Ultimately there would be 16 acceptance parks, but it should be emphasised that their existence was largely owed to continuing failures in supply, not only of engines but also of components such as crankshafts, magnetos, and ball-bearings. Although the government took upon itself responsibility for the production and allocation of these critical items, it was found much easier to increase the rate of manufacture of airframes, using a wide range of companies—many of which had not produced aircraft before. Thus, there was a rapid build-up in stocks of airframes pending availability of what would now be termed, government furnished equipment. The acceptance parks were therefore established to enable airframes to be accepted formally from the manufacturers, pending completion, so avoiding the possibility of congested factories and production bottlenecks.[21]

By July 1916, deliveries to the Royal Flying Corps in France had reached 120 aircraft per month, rising to an average of 1,300 per month in 1917.

In the event, this system worked remarkably well, although it would clearly have been preferable and more efficient to deliver aircraft and equipment direct to the depots. When an airframe was completed by the manufacturer it was inspected by the Aeronautical Inspection Department (AID), and once passed, delivered (generally by road) to the appropriate park for completion and onward despatch to the depot. For example, Armstrong Whitworth FK. 8 - Serial No. B 273 - was passed by the AID, less engine, at Newcastle on 21 June 1917 and despatched to No. 8 Aircraft Acceptance Park at Lympne on 25 June. The aircraft was successfully flight-tested on 12 July, after installation of its 160 horsepower Beardmore engine, and delivered to No. 1 Aircraft Depot at St. Omer on the same day for wireless equipment, guns, and other accessories to be fitted. The completed airframe was then transferred to No. 2 Aircraft Depot at Candas on 31 July, where it remained in store until issued, as received, to "A" Flight, No. 2 Squadron, on 1 September—some nine weeks after it left the manufacturer.

The main elements of the logistic system in place by this stage of the war are illustrated in Figure 3. The Army Air Parks and flying squadrons comprised the mobile element, while the depots (in theory) were static. It will be noted that the OASD is no longer shown, having been absorbed by the RFC in January 1917 when the latter took responsibility for the supply and storage of all aeronautical materiel. On the ground, the network of parks and squadrons had grown (Figure 4), supporting over 800 aircraft—double the RFC's frontline strength in 1916.

The division of work between the various elements of this system was designed to ensure the flying squadrons could meet their operational task, yet not be encumbered with excessive equipment and personnel that would limit their mobility. Given the common perception that warfare on the Western Front was a rather static affair, this might seem an unnecessary concern, but in fact, the RFC's squadrons moved surprisingly regularly—very much as the operational situation dictated. Thus, No. 9 Squadron, employed on the Western Front from December 1915 until the Armistice, was based at 20 different airfields in France and

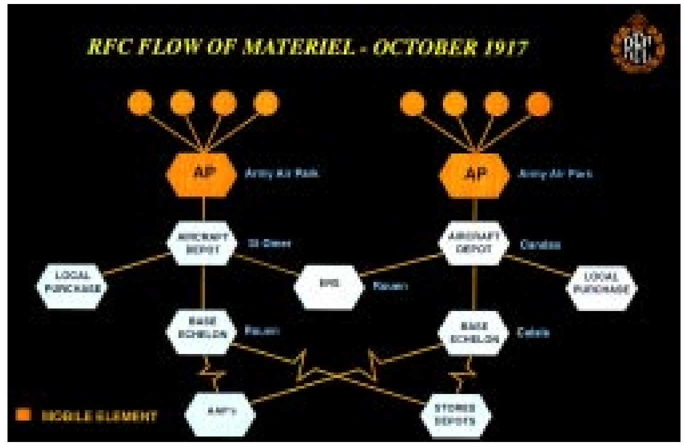


Figure 3. Royal Flying Corps Flow of Materiel - October 1917

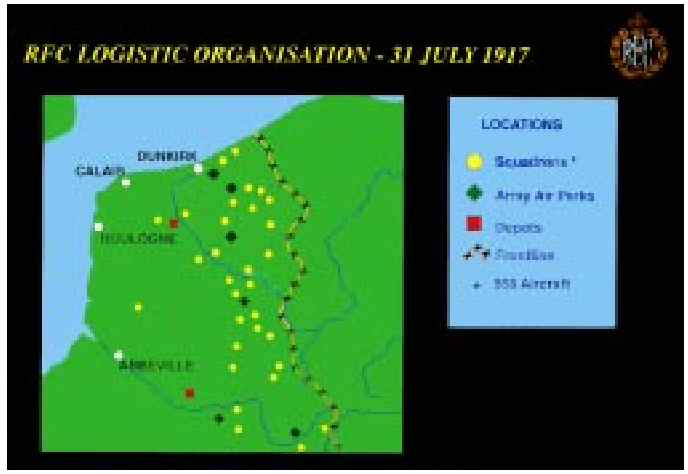


Figure 4. Royal Flying Corps Logistic Organisation - July 1917

Belgium, roughly a move every two months. Some of these deployments were major relocations to a different Army area, up to 70 miles away, while others were successive moves to keep in touch with the changing front, as in the last few months of the war. In all cases, the squadron was able to conduct operational sorties within 48 hours of leaving its previous location—an impressive achievement.

It is perhaps appropriate at this stage to look at the individual squadron logistic organisation in a little more detail. The RFC squadrons in France nominally retained the pre-war establishment of 12 aircraft, but this was usually augmented during active operations; in the case of the Corps squadrons up to a total strength of 21 or even 24 machines. Each flight had its own flight sergeant responsible for some 35 or so mechanics, allocated in small groups to specific aircraft. The flight fitters carried out daily servicing and minor adjustments (such as valve grinding) on their own aircraft while the headquarters flight undertook deeper maintenance and rectification (effectively, the equivalent of second line). Together with the inevitable specialist sections (wireless, photographic, armament, stores, and so on) and support staff, each squadron needed some 190 ground personnel and 45 vehicles to keep it in the field.[22] The latter included provision not only for the transportation of tents and hangarage, but also for a wide range of mobile facilities, including machine shops, wireless vans, generators, darkrooms, and so on. Moving this number of personnel and their specialist

Each flight had its own flight sergeant responsible for some 35 or so mechanics, allocated in small groups to specific aircraft.

equipment safely across the poor roads of the Western Front was a major challenge. That the RFC was able to do so consistently, notwithstanding the lack of prepared airfields and the limited availability of suitable accommodation and other infrastructure, is evidence for the high degree of mobility that was actually achieved.

The flexibility of the overall system was such that it was able to take on additional responsibilities, including the supply of air ammunition from 1917 onwards, as well as greatly expanded salvage, stores, and transportation capabilities as the war progressed. This was achieved by the simple expedient of adding individual specialist sections subordinate to the air parks and depots. Thus, in October 1917, when the volume of new aircraft deliveries (then averaging 400 a month) and the quantity of repair and salvage work were beyond the capabilities of the depots, the existing repair sections were separated from their parent depots and expanded into Aeroplane Supply Depots (ASD) responsible solely for aircraft receipt, issues, and repairs. This left the depots to concentrate purely on the receipt and issue of aeronautical spares and the reception, repair, and issue of Motor Transport.[23] At the same time, it was also decided to create a strategic transport reserve by withdrawing a proportion of each squadron's vehicles to form a Reserve Lorry Park (RLP) attached to each brigade—arrangements that more than proved their worth during the RFC's desperate but largely successful redeployment in the face of the German March 1918 offensive.[24] These developments marked the last significant changes to the logistic system before it was inherited by the RAF on 1 April 1918.

By October 1918, and the final Allied offensives, the RAF's logistic arrangements were as shown in Figure 5. The notable changes compared to 1917 are the introduction of the Aeroplane Supply Depots and Reserve Lorry Parks, but equally importantly the organisation had expanded (Figure 6) to support almost twice as many aircraft. In the last few months of the war, as the front advanced rapidly, it became necessary to move forward the Issues Sections of the Air Parks to keep in touch with the squadrons. Similarly, advanced sections of the main depots were deployed to railheads close to the advancing armies in order to maintain supplies to the rapidly moving Air Parks. These changes were successful, reflecting once again the basic strength and flexibility of the logistic system established by the RFC.

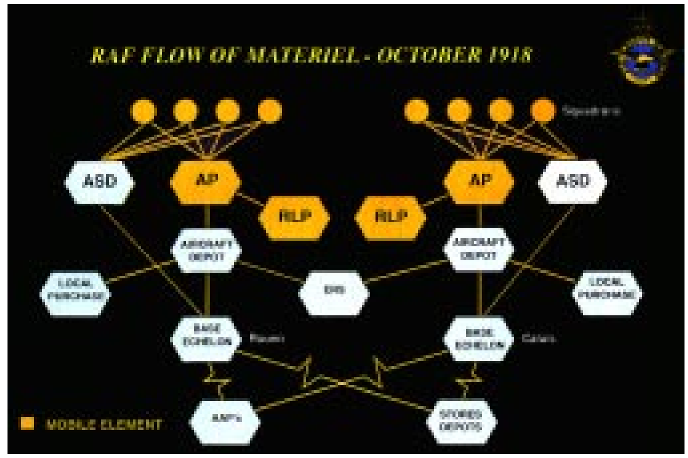


Figure 5. Royal Flying Corps Flow of Materiel - October 1918

Figure 6. Royal Flying Corps Logistic Organisation - August 1918

To conclude, between 1912 and 1918 the RFC developed a highly sophisticated and extensive logistic system, managed by professional technical and stores officers, that was able to provide effective support for deployed mobile operations, including extended periods of intensive fighting, while coping with an immense increase in numbers and technical complexity. The RFC was very much the pioneer in this field, providing an example for other air arms including those of France and the United States. Indeed, the Air Service of the American Expeditionary Force (AEF) chose to adopt a very similar system, including terminology, when setting up their own supply and technical support arrangements for the Western Front in 1917.[25]

The RAF never commissioned a "logistics lessons learned study," but had they done so their experience might have been summarised, as follows:

Air power was an expensive weapon. Air expenditure was running at approximately one million pounds a day by the end of the war.

Maintaining aircraft away from the home base demanded considerable resources. The 1,800 aircraft deployed on the Western Front at the end of the war required some 50,000 support personnel in France and Belgium, together with 2,000 aircraft in reserve or at the depots, and an extensive network of supply and repair facilities. In short, the RFC discovered that the "tail to teeth" ratio for combat aircraft was considerable.

Attrition on active operations was extremely high. By the end of the war, the average monthly aircraft wastage rate was 52%. In the last ten months of the war, 7,230 aircraft were delivered to the RFC in France just to make good operational losses. In-theatre repair and salvage, although important (particularly in the case of aero-engines), could never make up for this deficit. [26] Only the home base and its industrial capacity could meet such needs.

Effective support demanded the ready availability of spares. At the Armistice, the Expeditionary Force was operating some 20 aircraft types and 23 different engines. Without a wide range of readily available spares, the flying squadrons could not have continued to operate nor could the depots have been able to issue or repair over 900 aircraft each month as well as 500 engines. [27]

Rail and motor transport were critical to the supply pipeline. Without a rapid and effective system to distribute stores and consumables, the RFC could not have sustained the required levels of mobility and operational tempo. The importance of motor transport was such that by April 1918, the RAF possessed over 8,500 vehicles and motorcycles compared to just 700 in 1915.

Rail and motor transport were critical to the supply pipeline.

Preserving mobility was a constant battle. It was rapidly discovered, that the natural tendency of deployed units was to regularise support arrangements, establishing ever deeper roots and inevitably growing larger with time. Without constant and regular attention to these aspects, mobility rapidly suffered.

The essential "lubricant" was manpower. Without the determination, flexibility, and professionalism of large numbers of skilled tradesmen, on the squadrons and in the depots and parks, there could have been no logistic system.

These are, of course, the results of my own analysis, but they are very similar to the principles established by the AEF, who concluded that, to be effective, the Air Service's supply system had to be:

- Adequate in scope with a margin of capacity to meet unplanned arisings.
- Adaptable to new conditions and resourceful in either manufacturing or securing in the open market any of the manifold commodities it might be called upon to furnish.
- Equipped with extensive material facilities; and manned by adequate numbers of well-trained personnel. In this respect, it was stated, "there should never be an undue fear of placing with the supply and instruction centres a large proportion of the soldiers of the Air Service. An undermanned service of supply is a vital handicap to the Front." [28]

Eighty years on, these seem to me to remain eminently sound principles for the conduct of logistics support to deployed operations.

It would be misleading to suggest that these lessons were entirely forgotten by the RAF during the inter-war period but, under the pressure of peace and financial stringency, an organisation that comprised at its peak 24 repair depots at home and overseas, 12 aircraft parks, 16 aircraft acceptance parks, 7 stores depots, 10 stores distributing parks, and numerous subsidiary units, was reduced by the 1920's to just 6 home depots and 3 overseas. [29] What is more significant, however, is that there was no place in the peacetime organisation for an engineer branch and thus none of the 5,000 technical officers serving with the RAF at the end of the war were retained. In the future, their duties would be undertaken by General Duties officers. I leave it to others to comment on the wisdom and long term impact of this decision.

Notes

1. A personal account of the rationale behind this system is provided by Sir Frederick Sykes, *From Many Angles*, pp. 94-95.
2. Major Sefton Brancker, in a lecture reported by Flight dated 12 June 1914, commented that the difficulties of maintenance were sometimes lost sight of—the aeroplane and its engine being both delicate and fragile—necessitating the provision of large quantities of spare parts and portable tents for housing machines. As a result, only a small proportion of aeroplanes in the field would be fit to take to the air at any given moment.
3. Each squadron's war establishment comprised: 1 Crossley touring car for the CO; 6 Crossley light tenders for the conveyance of riggers, men, and boxes; 6 heavy tenders for the transport of large spare parts, camp equipment, etc.; 3 reserve equipment lorries; 3 shed lorries, 3 flight repair lorries fitted with hand-power tools, electric lighting plant, raw materials, etc.; 1 heavy repair lorry fitted with machine tools; 1 lorry carrying spare parts and stores for the mechanical transport; 1 baggage lorry; 1 lorry for POL; 6 motorcycles; and 6 aircraft trailers. By December 1915, the establishment for a Corps squadron had risen to a total of 30 lorries and light tenders with 8 motorcycles and sidecars and 8 aircraft trailers.
4. An analysis of the Army's 1912 manoeuvres showed that 8 steam wagons, 10 heavy lorries, 12 light tenders and 8 motor cars had been required to keep 2 airships and 14 aeroplanes in commission.
5. In this respect, the experience of the Air Service of the American Expeditionary Force (AEF) mirrors the RFC's, although an overall shortage of trucks forced the AEF to centralize the management of all motor transport, much to the chagrin of the Air Service who envied the RFC's independence. Roger G. Miller, "What to Do With the Truck?," *Air Force Journal of Logistics*, Winter 1997.
6. The mobilisation plan had called for 24 aircraft to be crated, but in the event, the balance was either flown direct to France or used to make up deficiencies on the squadrons.
7. Technically speaking, St Omer was the Aircraft Park's advance base—the base echelon remaining at Rouen.
8. Maurice Baring, *Flying Corps Headquarters 1914-1918*, pp. 145-146, Heinemann, London, 1930, describes the problems faced by the operational squadrons arising from the confusion between English and French spares.
9. The supply of complete machines and vehicles was in the hands of the Director Military Aeronautics at the War Office.
10. The AID had been formed in December 1913 as an inspecting body for aircraft construction and acceptance. Originally under the overall control of the War Office, it was in effect civilianised in March 1917 when control was passed to the Ministry of Munitions and its remit extended to deal with the supply of all aircraft. The AID had grown into an organisation of some

10,600 personnel by the end of the war. For a history of the AID in the First World War, see *Aeroplane Monthly*, November 1993.

11. In August 1914, the Air Park was responsible for just 63 aircraft in the field, but, by May 1915, this had risen to 156. More significantly, 2,260 aircraft and 2,953 engines were on order. *Statistics of the Military Effort of The British Empire*, HMSO, 1922.
12. The ERS output in August 1916 was roughly 100 engines per month with an establishment of 10 officers and 406 O/Rs. It was agreed to increase this in two stages until, by May 1917, the output reached 400 engines per month with an establishment of 32 officers and 1702 O/Rs, *AIR1/529/16/12/75*. The total output for the last year of the war (ten months) of repaired or rebuilt engines reached 3,196 from an establishment of 4,532 personnel of all ranks. *AIR1/686/21/13/2252*.
13. The perceived advantages arising from this policy were: immunity from civilian labour troubles; the training potential to the Service in undertaking the work; and the reduced turnaround time because of the proximity of Service workshops to the frontline. *History of the Ministry of Munitions*, Vol. XII, Part 1, Chap. III, pp. 79-81. However, it was also recognition that industry could not keep pace with repair requirements. In June 1918, for example, there was a total outstanding deficiency of 1,491 repaired engines from civilian firms as compared with the scheduled output.
14. Raleigh & Jones, *War in the Air*, Vol. II, pp. 188-190.
15. By early 1916, the Army's total petrol consumption had risen to over 2,000,000 gallons a month of which at least 200,000 gallons was aviation spirit. By 1918, the RAF required at least 600,000 gallons per month to sustain operations. *Military Operations in France & Belgium 1916*, pp. 102-104. Some bulk distribution arrangements were put in hand in 1918 to support the Handley Page bombers of the Independent Force and there were plans to provide each Reserve Lorry Park with dedicated fuel trucks but, for the majority of the war, all aviation fuel for the RFC in France was provided in cans.
16. Raleigh & Jones, op. cit., Vol. IV, p. 358.
17. Ibid, Vol. VI, pp. 92-93.
18. Ibid, Vol. IV, p. 202.
19. Two grades of equipment officers were initially established, Equipment Officer (with the rank of Capt) for wings, and Assistant Equipment Officer (with the rank of 2/Lt) for squadrons.
20. For example, in 1917, No. 9 Squadron had on its strength one Equipment Officer (Grade 3) Squadron and three Equipment Officers (Grade 3) Wireless.
21. In August 1918, there were more than 4,200 machines in store without engines. *History of the Ministry of Munitions*, Vol. XII, Part 1, Chap. III, p. 79.
22. For fighter squadrons, the formal establishment was smaller, comprising 149 ground crew and 35 vehicles.
23. The new organisation came into effect on 1 November 1917, comprising No. 1 Northern ASD (reception park at Marquise, repair park at St Omer, and issue section at Sery) and No. 2 Southern ASD (repair park and issue section at Fienvillers). The strength of the former was 92 officers and 2,235 other ranks and the latter, without a reception park, 50 officers and 1,905 other ranks—based on 80 squadrons employed on the Western Front. The strengths of No. 1 and No. 2 Aircraft Depots were adjusted accordingly, both units comprising 43 officers and 1,697 other ranks. *AIR1/1084/204/5/1721*.
24. The RLP's were initially established with 30 lorries and 24 trailers, but an additional section of 15 lorries and 12 trailers was authorised in February 1918. Raleigh & Jones, op cit, p. 353.
25. The French also organised their aeronautical supply on the RFC system with "Grand Parcs" and "Parcs" matching the roles of the depots and air parks in support of the individual escadrille.
26. In October 1918, some 200 aircraft were repaired or rebuilt from salvage compared to the 3,756 built that month.
27. A total of 131,339 tons of aircraft stores was shipped to the RFC in France over the course of the war, as well as 2,103 aircraft in crates (the large majority of aircraft were delivered by air, however). *Statistics of the Military Effort of The British Empire*.
28. Report On The Inter-Allied Board of Supply, Chapter XVIII, Section 6, *AIR2/151/290308/20.*
29. According to the scheme for the permanent organisation of the RAF published on 13 December 1919.

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Munitions Experience in a Downsizing Air Force

Olen D. Sheperd

In April 1996, the Air Force Inspection Agency initiated a Functional Management Review (FMR) at 12 Air Force organizations. Their stated purpose was to "assess the effect of the maintenance officer career fields consolidation and determine if the Air Force is building an officer base to satisfy critical duties in munitions, weapons safety, and nuclear surety positions." The FMR had three findings: (1) Initial and follow-on training for officers selected for munitions . . . positions was insufficient. (2) Identification of maintenance officers with munitions experience for assignment purposes was insufficient. (3) Unit senior leadership failed to emphasize munitions experience, which created the perception the munitions portion of the maintenance officer career field was not important.

Air Staff personnel, working closely with counterparts at the Sheppard AFB "School House" and the Air Force Personnel Center (AFPC) at Randolph AFB, addressed the first two findings. First, we increased the length of the Aircraft Maintenance Officer Course (AMOC) from 60 to 70 days, with the additional days all devoted to munitions training. Second, a new conventional munitions officer Air Force Specialty Code (AFSC) suffix (21AxB) became effective in April 1998.

The third finding—the perception that the munitions portion of the maintenance officer career field is not important—is a "tougher nut to crack."

One of the early post-cold war personnel changes, brought about by the anticipated reduction of Air Force manning, was the 1991 consolidation of the munitions and aircraft maintenance career fields. The reasoning was behind the thought that the Air Force could not afford to "stovepipe" our officers into a single career field. Fortunately, with DESERT SHIELD and DESERT STORM, there was still a sizable cadre of well-qualified munitions officers. Today, with the passage of time, we are seeing a decline in the number of qualified mid-career and senior officers with munitions experience and expertise. Recent adverse findings during Inspector General inspections, particularly in the nuclear munitions readiness areas, highlighted the need for more emphasis on munitions experience and training. As already noted, effective with the January 1998 class, Air Education and Training Command (AETC) expanded the 60-day Aircraft Maintenance Officer Course by adding 10 more days of munitions instruction to the previous five. These 15 days will represent almost 25% of the course for new maintenance officers.

But will that be enough? Arrival at his/her first operational duty station may result in assignment to the munitions storage area—but even if it does, there is little likelihood the young officer will remain there for the standard three-year tour. The post-1991 goal to produce logistics officers often means mid-tour reassignment to flight line or back shop maintenance billets. When these first tour officers are up for reassignment, the Aircraft/Munitions Maintenance Assignments Section at AFPC reports little interest in munitions billets—aircraft maintenance is where they want to go. Since flight line sortie generation is a key factor in the maintenance experience, who can blame them? From a total force perspective, the problem with this situation is we are building an Air Force that can maintain high peacetime sortie rates, but which may not be very knowledgeable at war fighting. If officers with substantial munitions experience are not developed and promoted with their peers, it will be difficult to generate critical wartime sorties. Decisions are made daily that hinge upon knowledge of munitions. Many of these decisions occur at the highest levels of Air Force command and have global significance. If this knowledge is not developed during the early years of an officer's career, later and perhaps hasty exposure to "munitions" is likely to be superficial at best.

Some officials say that senior conventional munitions technician (2W0) and armament technician (2W1) noncommissioned officers (NCOs) will afford a wartime safety-level of munitions experience. In addition to supervising the generation of strike sorties, the thought is they would provide a level of on the job training (OJT) to their young flight commander. But the cadre of DESERT STORM-experienced NCOs is moving toward retirement. Aside from the 1995 strikes launched from Aviano AB, Italy, practical experience for mid-career NCOs has been limited to training exercises—and even these have been cut back severely. Future commanders would be ill-advised to expect there will be enough NCOs with the managerial skills to handle simultaneous strike generations and officer training responsibilities.

Fortunately, the Air Force Combat Ammunition Center (AFCOMAC), established in 1985, can provide a level of relief to the dilemma. The Center, now located at Beale AFB, California, played a major role in training the munitions handlers so important to DESERT STORM. The AFCOMAC basic course continues to turn out approximately 475 enlisted and 25 officer personnel per year. Over the past 12 years, 300 company grade officers have completed the basic course. This three-week course, one of the few where officer and enlisted personnel train together, normally consists of 70 students. The class rank structure is intended to mirror a deployable munitions flight. Training includes combat planning, munitions distribution systems, development of conventional munitions plans, combat production concepts, production tasking, practical assembly of tasked munitions, and a mass production exercise.

For the 21A1 or 21A3 maintenance officer, the basic course will take on an added significance with the advent of a new conventional munitions suffix. To be assigned this "B" suffix (for example, 21A3B), a two-path route will apply. One path will be a minimum of 12 months assigned to munitions duties, some portion of which must be in a munitions storage area. The other time-condensed path will include completion of the AFCOMAC

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Operation JUST CAUSE: Panama

Captain Thomas J. Snyder, USAF
Captain Stella T. Smith, USAF

Editor's Note: The following article is Chapter 2 of The Logistics of Waging War, Volume 2, US Military Logistics, 1982-1993, The End of "Brute Force" Logistics, which has been published by the Air Force Logistics Management Agency. This monograph chonicles logistics efforts and operations from 1982-1993 and examines the final chapters of what has been aptly called the era of "brute force" logistics. Volume 2 is available on the World Wide Web (http://www.il.hq.af.mil/aflma/lgj/lww2.html).

> "Carlos, I've talked to the chief and I've talked to the chairman, and you are my man for everything that has to be done there. I'm putting you in charge of all forces and you've got it: planning, execution, the whole business. I have looked at my staff and I have told the chairman and the chief that it cannot run a contingency operation. He said you can have it and I'm holding you responsible" (1:55).

General Maxwell Thurman spoke these words to then Lieutenant General Carl Stiner. As a result, a major problem faced during Operation URGENT FURY was avoided. One of the lessons learned from the military action in Grenada was that a complex, multi-layered command and control organization, and extremely poor communications between the different forces involved created many logistics problems (2:105). General Thurman believed that, by putting General Stiner in charge of the entire operation, problems that had plagued Operation URGENT FURY, such as low priority aircraft landing ahead of high priority aircraft, would be avoided.

Background

Operation JUST CAUSE was a military action taken by the United States with several objectives: remove General Manuel Noriega from power, protect American lives, restore democracy to Panama, and secure US treaty rights to the Panama Canal. US forces faced many logistics challenges meeting these objectives. Troops and equipment had to be flown to the theater of operations and set up in secure areas to wait for the operation to begin. Food and medical supplies needed to be sent to maintain the troops. Security guards and locations to keep prisoners of war would have to be in place when needed. Fuel and ammunition to keep the troops working effectively were required.

General Noriega was the head of the Panamanian Defense Forces (PDF) and effectively the dictating ruler of Panama. He had been indicted by two Florida grand juries for involvement with drug cartels (1:21). Noriega was also believed to be the instigator of harassment against Americans and American servicemen stationed in Panama. While tensions were high on both sides, the actions of PDF guards provoked a reaction from the White House approving the use of military forces to remove Noriega from power. US servicemen were being stopped and arrested for no obvious or legitimate reason. Some were detained at PDF facilities and harassed. Others had assault rifles aimed at them. Still others were beaten. Tensions continued to escalate culminating in an incident on December 16, 1989, when Marine Lieutenant Robert Paz was shot and killed by PDF guards at a roadblock. On December 17, President Bush ordered the execution of Operation JUST CAUSE. H hour was set for 0100, December 20, 1989 (2:210).

Airlift

The plan for Operation JUST CAUSE was to use overwhelming force to attack multiple locations at the same time. US forces hoped that the strategy would intimidate the PDF and force them to give up with little resistance. To accomplish this task, the planners spent considerable time figuring out how to secretly move large amounts of troops and equipment in a short time. The Military Airlift Command (MAC) did just that. Headquarters MAC determined it would need 60 hours to prepare the crew force needed for the invasion, including 36 hours to locate the crews and get them assembled and 24 hours for mission planning, preparation, and flight time (3:195). In the first hours of the operation, MAC airlifted 3,500 Army Rangers and paratroopers along with their cargo to three separate combat zones. This required the use of 63 C-141s and 21 C-130s (4:42).

Also helping out in the airlift were the Air National Guard (ANG) and the Air Force Reserve (AFR). MAC deployed 111 aircraft from 24 units while the ANG and AFR provided reserve support from 18 units. The ANG provided both strategic and tactical airlift support on C-5s, C-141s, and C-130s. The total number of personnel airlifted on the night of the invasion consisted of 10,000 combat troops. Six thousand troops landed for deployment while 4,000 parachuted to prescribed sites. These troops were in addition to the 13,000 troops assigned to duty in Panama at several US installations. The aircraft took off from several bases in the US and flew at low altitudes to avoid exposure to Cuban radar. Panama was considered a secure area for air operations with threats limited to ground fire. Only 14 aircraft reported damage, the majority from small arms fire. No aircraft were lost during the airlift mission. The final success of the operation can be attributed to the effectiveness of the airlift in deploying troops and equipment in such rapid fashion (2:115-117).

MAC employed 84 aircraft in the initial operation for airdrop operations. These planes had to fly in from the US, converge on one of two drop zones about 100 kilometers apart, and drop their loads while avoiding detection by Cuba or the PDF. All of this was happening around 1 a.m. Panama time. This operation was the largest night combat drop since World War II D day (5:30). To make all of this happen, refueling plans were necessary. Since C-130s could not be refueled in flight, they had to land at one of the US secured airfields to refuel. Additionally, Strategic Air

Loading a Jeep on a Military Airlift Command (MAC) aircraft for transport to Panama. (Official US Air Force photo)

Command (SAC) provided KC-135 and KC-10 tankers to refuel C-141s and C-5s moving troops and equipment into the theater. These tankers came from 26 squadrons from 14 bases located in the US (2:75-77).

Weather

Weather posed some problems at several locations providing the airlift support. Fog at Travis AFB, California, caused the 7th Light Infantry Division to board at Monterey Airport instead of Travis (5:31). On the other US coast an ice storm at Pope AFB, North Carolina, caused a delay in the departure of paratroopers from Ft. Bragg. The key to aircraft leaving Pope at all was the preparedness of the Army Material Command's logistics assistance office (LAO). The LAO provided 321 barrels of deicing fluid needed to prepare the aircraft for flight (6:6). However, the delay in meeting the logistics challenges may have been responsible for the eventual interception of these C-141s by Cuban MIGs. Since these planes arrived well after the assigned starting time, the Cubans may have been alerted and were watching inbound routes more closely for air traffic. Several MIGs were launched from Cuba, but fortunately did not impact the completion of the C-141's mission (2:91).

Air Superiority

Aside from the encounter with the Cuban MIGs, the US had uncontested air superiority. The main reason for this was that the PDF did not have any fighter aircraft and no military aircraft permanently stationed at Rio Hato, the Panamanian Defense Forces installation on the southern coast (7:32). This allowed MAC to drop troops exactly where US commanders wanted them. It also permitted Air Force and Army aviation to provide close air support as needed. Ground forces operated without fear of enemy air attacks and resupply by air was uninterrupted (2:67).

Special Operations

Special operations aircraft had a significant role in Operation JUST CAUSE. On the first night, 65 helicopters and 20 fixed-wing special operations aircraft provided support. This amounted to the largest single employment of special operations aircraft in US history. The helicopters were used to transport troops to their assigned positions and to suppress enemy ground fire. The AC-130 gunships were used to attack the PDF installation at Rio Hato as well as give ground support by suppressing enemy ground fire (2:118-120).

Depot Support

To process the required personnel and equipment for deployment, logisticians were assigned to arrival-departure airfield control groups (ADACGs). They developed the plans used to load the equipment to be air dropped or delivered to Panama. Equipment had to be palletized, weighed, measured, and inspected to meet safety requirements and load restrictions of the aircraft. Support personnel at the depots worked 24-hour shifts to fill requisitions. The Defense Personnel Support Center (DPSC), in Philadelphia, Pennsylvania, processed 95% of the supply requirements of the Defense Logistics Agency (DLA). This included more than $13.3 million worth of food, clothing, and medical supplies. The Defense Fuel Supply Center (DFSC), in Cameron Station, Virginia, arranged for one million extra gallons of JP-4 aircraft fuel to go to Barksdale Air Force Base, Louisiana. They also delivered 185,000 barrels of JP-5 fuel to Defense Fuel Supply Point Rodman. Defense Construction Supply Center (DCSC), Columbus, Ohio, supplied spare parts for Black Hawk helicopters, five-ton trucks, and high mobility, multipurpose, wheeled vehicles. At Defense Depot Mechanicsburg, Pennsylvania, more than 1,328,500 pounds of materiel was put together for airlift to Panama. Many other depots and centers supplied tons of materiel in support of the operation (8:2-4).

A major debate of any logistician during a conflict is whether to push parts and other supplies or wait until they are requested. The logistics assistance offices (LAOs) for the Army Materiel Command worked out a compromise. Packages of parts and ammunition were offered to the task force to help streamline the process. The LAO also helped find available seats for defense contractor civilians deployed to Panama. With the limited passenger seats on the aircraft, civilians were strictly controlled.

Problems

The logistics system did not operate without problems. There was no in-transit visibility of ultimate destination of shipments. This caused confusion at the ports of debarkation and embarkation. Pallets did not have adequate marking and data sheets associated with them to quickly determine the contents and destinations (6:7-8). These problems occurred from a lack of complete directives given to the personnel who assembled the pallets. The difficulty in efficiently moving supplies illustrated the need for in-transit visibility and complete identification of palletized resources.

Theater Support

The 193rd Support Battalion provided in-theater support. This involved providing for the logistics needs of more than 25,000 troops deployed to Panama. The 193rd established a distribution center at Luzon Field, Fort Clayton, Panama. After the first six days of the conflict, the battalion distributed 321 short tons of various classes (I-IX) of materiel, including 25 short tons of water. Eighty five percent of the tonnage went by CH-47 helicopters. They also operated two refueling points that pumped out approximately 110,000 gallons of fuel during the initial eight days. Alpha Company established an ammunition transfer point along with a graves registration point. The Battalion's 1097th Transportation Company supported missions by transporting 2,442 passengers, 848 prisoners, and 738 short tons of cargo. Much of this support was provided under enemy fire (9:8).

In support of the overall operation, the Military Airlift Command flew 775 missions to transport 39,994 passengers and 20,675 tons of cargo. This amounted to approximately one-half ton of cargo for each person deployed during the operation. The special operations units added an additional 796 missions neutralizing PDF resistance. Eight C-5s and fourteen C-141s provided humanitarian airlift efforts intended to provide for families of American troops stationed in Panama as well as Panamanian people displaced by the operation. They transported 3 tons of medical supplies, 10,000 blankets and sheets, several tons of baby food and food staples, and 2 million field rations. After the first day's operations, MAC aircraft were used to deploy 2,500 troops for security. Return trips to the US were used to evacuate wounded service personnel along with materiel no longer needed in the theater. The wounded were brought to Kelly Air Force Base, Texas. Two hundred and fifty seven patients were flown aboard one C-130 and eight C-141s (3:197-8).

Medical

The mission of medical logistics was to provide materiel to care for casualties and ease suffering. The medical logisticians had to determine the size, location, and duration of casualty flow to determine the scope of support needed. Fortunately there were adequate medical inventories already positioned in US medical treatment facilities located on the US military bases in Panama. The medical supplies were airlifted to Howard Air Force Base, Panama, to be distributed from there. The medical logistics experts in Panama were not given information about the conflict prior to its occurrence and therefore implemented the medical logistics plan given to them after H hour. The plan called for the Joint Casualty Collection Point (JCCP) personnel to bring adequate supplies and equipment stocks with them as they deployed. Resupply then came from the Continental United States (CONUS) pipelines. This method caused a shortage of routine items such as litters, blood expansion fluids, sterile gauze, and other items.

A wounded US serviceman is loaded for transport to a medical facility. (Official US Air Force photo)

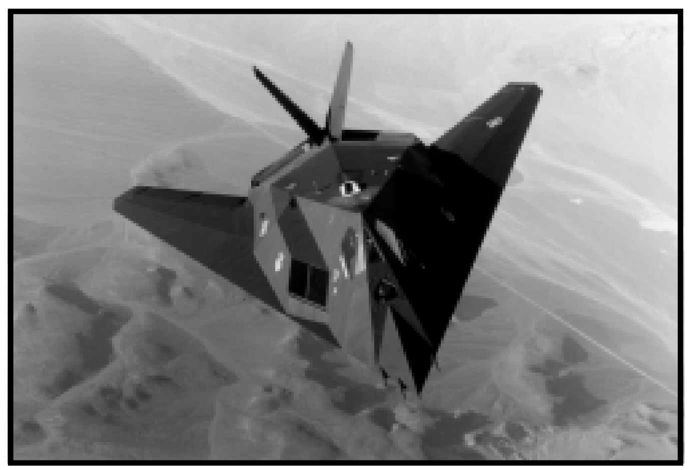
Restocking supplies came from the Emergency Supply Operations Center (ESOC) at the DPSC in Philadelphia, Pennsylvania. Requests were made by AUTOVON and FAX to Wilford Hall Medical Center, Lackland AFB, Texas. Medical logistics personnel pulled, packed, palletized, and loaded the requested materiel for delivery within 24 hours of the request. Medical Logistics (MEDLOG) system, an automated supply and equipment inventory transactions system, was available on the computer systems, but only after a secure, uninterruptable power supply was established (10:2-5).

Additional medical logistics were handled using the Theater Army Medical Management Information System for Medical Supply (TAMMIS-MEDSUP). This is a computer software program that automates combat patient records, tracks blood inventories, and manages other medical logistics data. (8:5)

F-117

The Panama attack was the first combat mission for the F-117A fighter. This aircraft was designed to penetrate radar and air defenses and perform single-aircraft attacks on high priority targets deep behind enemy lines (7:32).

The F-117s were to drop two 2000-pound bombs near a PDF barracks at Rio Hato to stun the PDF into giving up without a fight. The F-117 was used because of the needed accuracy of the bomb drops. The aim was not to hit the PDF, but to scare them enough to give up. Six F-117s were flown to Panama to drop the bombs or to support other missions if needed and then returned to the US without landing. Refueling in flight was required for these aircraft (7:32-33; 11:30).



The F-117 was first used in combat during Operation JUST CAUSE. (Official US Air Force photo)

Enemy Assets

Another logistics issue that arose during the operation was handling enemy assets. One large category of confiscated items was weapons and ammunition. Combat service support soldiers had to inspect, classify, and transport more than 700 tons of ordnance including more than 50,000 weapons captured from the Panamanians. They also had to manage other confiscated equipment. They sorted, classified, cataloged, and packaged 31 aircraft, 29 armored vehicles, 7 patrol boats, and 20 antiaircraft guns. Decisions about disposition of the items were made based on potential use. If the item could be used by US troops in-theater, it was forwarded to a unit that could best make use of it. Otherwise, all materiel was packed and removed from the theater (8: 5).

Lessons Learned

The overall success of Operation JUST CAUSE can be attributed to many things. The efficient nighttime airlift along with detailed planning and effective air traffic control were critical. Effective training missions by all of the forces prior to the conflict, especially those already in Panama enabled logistics requirements to be defined prior to the operation. Having 13,000 troops already stationed there and familiar with the surroundings was a tremendous benefit. Some of these troops were airlifted by MAC 11-18 May 1989, prior to the start of the operation. A total of 5,915 soldiers and marines and 2,950 tons of cargo were sent to Panama during this time period. To accomplish this feat, 34 C-5s, 39 C-141s, and 2 commercial L-1011 missions were flown (3:195). The fact that the PDF did not have an air force to speak of is yet another reason for the success of the missions. All of these facts need to be remembered in considering the overall success and lessons learned from Operation JUST CAUSE.

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basic course, followed by at least six months in a munitions storage area.

Captain Kyle Cornell is the Maintenance Supervisor of the 9th Munitions Squadron/AFCOMAC. A 1987 Reserve Officer Training Corps (ROTC) graduate of Angelo (Texas) State University and a 1992 graduate of Squadron Officer School, his career offers a insightful perspective on the importance of munitions experience for a career maintenance officer.

After completing the AMOC course in 1988, Captain Cornell was assigned to the 325th Fighter Wing at Tyndall AFB, Florida. There his assignments included Officer in Charge of the Fabrication Branch and Assistant Officer in Charge of the 95th AMU/Fighter Squadron. During a recent interview, he identified an early aversion to munitions duties. His stated philosophy was as long as the munitions trailers arrived at his aircraft at the appointed time, that was all he needed to know about munitions.

But after volunteering for a 1992 flight line maintenance assignment to Kunsan AB, Korea, Captain Cornell began a munitions-oriented learning curve. Real world events and constant exercises at that forward location made him realize he must learn more about what it takes to pull munitions out of storage, build them up, and deliver them to the flight line. When missions and targets changed, he had to develop a keen perception of what the new "frag" order meant in terms of ammo download, new ammo build up, and reload time—and ultimately, how this knowledge would be used to schedule "wheels up" time for the strike force. He acknowledged his biggest problem was how to predict ammo buildup time. Complexities of the different munitions types meant there could be no standard, per se.

Things didn't get any easier for Captain Cornell when, in 1993, he reported to Nellis AFB, Nevada. Again in charge of a flight line maintenance unit, half of his F-16 aircraft were Red Flag aggressors and half were test aircraft. With about 70% of all Air Combat Command's live munition training sorties originating on the Nellis ramp, he had to pay strict attention to the munitions requirements of the flying schedule. The same kinds of "frag" orders he encountered in Korea meant frequent reconfigurations and load changes for his Red Flag and test aircraft. Captain Cornell continued his quest to learn the munitions business and for his efforts was made commander of the Air Force's busiest and most diverse munitions storage area at Nellis. Now, two and a half years later, his "conversion" to "Ammo" is complete. In July 1996, he was assigned to his current position as Maintenance Supervisor, 9th Munitions Squadron and AFCOMAC, 9th Reconnaissance Wing, Beale AFB, California.

In summary, Captain Cornell represents the kind of munitions expertise that the Air Force must have for the future. As a flight line maintenance officer, he saw the importance of the munitions relationship and applied himself to improving his understanding of that relationship. While he says he might have been a better maintenance officer had he had more munitions training "early on," he certainly has corrected that deficiency.

Mr. Sheperd is presently the Deputy Chief of the Munitions, Missiles, and Space Plans and Policy Division, in the Directorate of Maintenance, Headquarters United States Air Force, Washington, DC.

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